Social Indicators Research
https://doi.org/10.1007/s11205-025-03582-1

ORIGINAL RESEARCH

A Socio-Economic Index for Occupational Stratification in Argentina: With Insights for Comparative Research

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Accepted: 11 March 2025

Abstract
This paper develops a country-specific Argentinean Socio-Economic Index (ARSEI) to measure the status of occupations in Argentina, using the 2015 *Encuesta Permanente de Hogares* (sample size = 50,947). The ARSEI scale is developed in an indirect-effect model that conceives of occupational status as an optimal scaling of detailed occupations that maximizes the indirect effect of education on earnings mediated by occupation, and by corollary minimizes the direct effect of education on earnings. The procedure followed is independently applied for *Código Nacional de Ocupaciones 2001* (CNO), the five-digit Argentinean occupational classification, and the International Standard Classification of Occupations, ISCO-08. To test the measurement quality of ARSEI, we use the 2021 *Estructura Social de la Argentina y Políticas Públicas Durante la Pandemia por COVID-19* dataset (sample size = 5239). Utilizing a Multi-Trait Multi-Method model, our findings indicate that ARSEI performs similarly for CNO and ISCO-08. While both classifications produce some random error (unreliability) in measuring intergenerational reproduction, systematic error (invalidity) is negligible. Our results suggest that CNO-based ARSEI performs slightly better than the ISCO-based ARSEI. However, the international ISEI index outperforms both ARSEI versions, lending support to Treiman's hypothesis that occupational stratification is basically constant across time and place. Our contribution to the research on the comparative measurement of occupational status is twofold: (1) comparing a country-specific classification to an international one, and (2) comparing a country-specific occupational scaling to an international scaling.

Keywords Argentina · Socio-economic index · Social stratification · Occupations · Status · Intergenerational reproduction

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1 Introduction

This paper develops the ARSEI — Argentinean Socio-Economic Index of occupational status — with the aim of understanding Argentina's occupational stratification as a socio-economic hierarchy. Argentina has used two systems to classify occupations in statistical data: the local CNO (*Código Nacional de Ocupaciones*; INDEC, 2001) and the globally recognized ISCO-08 (International Standard Classification of Occupations 2008; ILO, 2012). While CNO is aimed to be tailored to the country's specific labour market structure, ISCO-08 provides a standardized framework for comparing occupational structures internationally. However, it remains unknown whether ARSEI constructed from a country-specific classification will better capture Argentina's labour market characteristics than internationally validated measures reflecting global trends.

The main goal of this study is to present a valid measure for the vertical scaling of occupations in Argentina. ARSEI offers an instrument to analyse stratification processes such as intergenerational transmission of occupational status and the pattern of status attainment while enabling cross-country comparison. Understanding these dynamics in Argentina is relevant given the structural heterogeneity it shares with other Latin American contexts, which consists for the coexistence of diverse productive units within the same economy (ECLAC, 2014), leading to segmented labour markets with distinct employment relations, wage structures and access to social protections. The first key contribution of this study is the development of a socio-economic index that is applicable to both CNO and ISCO-08,[1] allowing for detailed and rigorous national research. Importantly, the ARSEI enables comparisons between data classified under CNO and ISCO without the need for converting one classification into the other.

The second goal of this paper is to test the "Treiman constant" (Hout & DiPrete, 2006) by determining whether an international socio-economic measure of occupational status also accurately reflects the occupational structure of Argentina. To achieve this, we compare the country-specific ARSEI with the International Socio-Economic Index ISEI-08 (Ganzeboom, 2010), developed using data from 42 countries across various world regions (Latin America, North America, Western and Eastern Europe, Scandinavia, Asia, Oceania, and Africa).

The paper introduces a tool for comparative research on occupational stratification within the Global South, emphasizing the Latin American context through the case of Argentina. As Argentina shares key socioeconomic and occupational characteristics with other countries in the region, it serves as a relevant example, offering insights specific to Latin America while contributing to broader discussions on stratification in the Global South.

We construct the ARSEI following the methodology developed by Ganzeboom et al. (1992), which applies an indirect-effect model. This algorithm optimally scales occupations by maximizing their role in mediating the relationship between education and earnings while minimizing the direct effect of education on earnings. We argue, building upon Ganzeboom et al., (1992), that constructing an SEI scale as an optimally mediating variable is both a conceptual and methodological advancement over previous approaches, particularly Duncan's (1961) original construction, which derived weights by predicting the prestige score of occupations. Conceptually, the ISEI algorithm highlights that occupations

[1] Fully documented in the online Appendices, link: https://osf.io/9axjq/?view_only=b987030791ff4afc81679c5366742f4c. Please cite this article when using these materials.

are the pivot of the process through which educational investments translate into labour market outcomes. It operationalizes the idea that occupations are the key intermediaries linking educational investments to labour market returns, and the method is tailored to capture this role. In addition, the indirect effects procedure of SEI construction removes the association with prestige scores, solving the longstanding confusion about SEI being approximate prestige scores. Methodologically, constructing ARSEI as an optimal scaling of occupation with respect to major covariates minimizes random error (noise, unreliability) in the measurement of occupational status.

Figure 1 illustrates the two pathways through which education influences income: one indirect via occupation, and the other direct, bypassing occupation. Like the ISEI (Ganzeboom et al., 1992, 1996), but using Argentinean data, ARSEI is constructed by standardizing education and income, then applying optimal weights to scale detailed occupation groups by these two indicators. The weights maximize the mediating role of occupation while minimizing the direct effect of education on income. Since CNO (INDEC, 2001) and ISCO-08 (ILO, 2012) codes do not align 1-to-1, we processed them independently, creating two distinct scales — one based on CNO and one on ISCO-08 — enhancing the applicability and validity of the ARSEI.

We regard Argentina's labour market as a case study to illustrate key features of occupational stratification commonly found across Latin America. These characteristics are the prevalence of informal employment, self-employed workers, unskilled work, and small-scale service jobs (Solís et al., 2019). These features align with the concept of structural heterogeneity described by ECLAC (2014), highlighting disparities in productivity and economic roles between segments of the economy. The Argentinean case may capture broader trends relevant to Latin America and the Global South. Given Argentina's labour market specificities, one would expect that constructing the CNO-based ARSEI provides a more accurate representation of occupational stratification than the ISCO-based ARSEI. By comparing ARSEI versions built on each classification, we test whether a locally

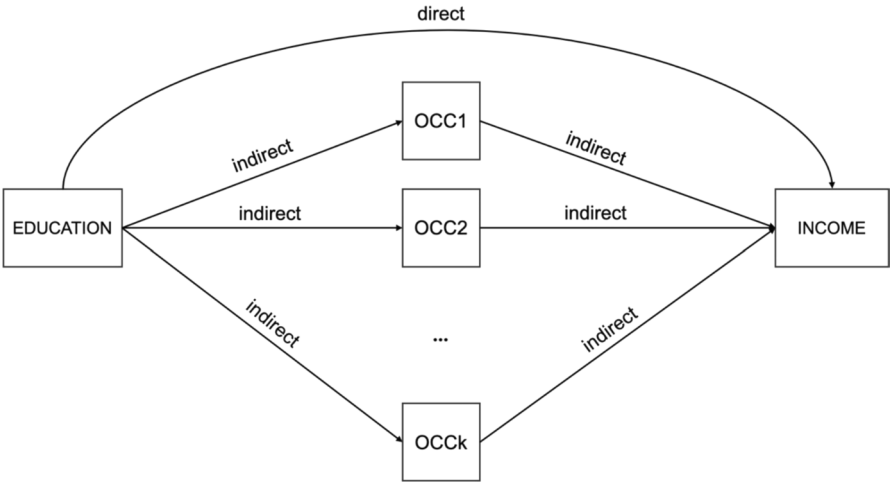

Fig. 1 Status attainment model with occupation as the mediating variable. Boxes represent variables: education, occupation (OCC1, OCC2, OCCk) and income. Arrows represent direction and type (direct or indirect) of the causal relationships between these variables. Source: developed by the authors, after Ganzeboom et al. (1992)

grounded classification like CNO offers greater sensitivity to Argentina's labour market characteristics than a global framework like ISCO-08.

Beyond local versus global classification systems, we also evaluate how the two versions of ARSEI compare to the internationally validated ISEI in representing occupational stratification within Argentina. This part of the analysis tests the validity of the Treiman constant (Hout & DiPrete, 2006; Treiman, 1977), which holds that patterns of occupational stratification are basically the same across different societies. By comparing ARSEI to ISEI, we aim to assess whether Argentina's occupational stratification follows global trends or whether it deviates. Our contribution to the research on the comparative measurement of occupational status is thus twofold: (1) comparing a country-specific classification to an international one, and (2) comparing a country-specific occupational scaling to an international scaling.

To rigorously accomplish both comparisons, we employ the MTMM (Multi-Trait Multi-Method) methodology used by Sno and Ganzeboom (2017, 2019) (see also Meraviglia et al. (2018), which allowed us to assess the validity and reliability of the new measure. Our model extends their approach by evaluating whether country-specific SEI scales improve measurement precision over internationally derived scales. Our findings suggest that the CNO-ARSEI demonstrates slightly superior performance compared to the ISCO-ARSEI, generating less random noise when modelling the intergenerational transmission of occupations. While both ARSEI versions effectively capture local nuances, they still show some limitations compared to ISEI, which strongly supports Treiman's thesis that occupational stratification is consistent across different contexts and periods.

2 Theoretical Background

2.1 The Pivotal Role of Occupation in Social Stratification

Social stratification refers to the uneven access to resources, which shapes the hierarchical organization of individuals that reflects their social standing within a society. Social standing is often expressed in the socioeconomic status (SES) of individuals, which is a combined measure of an individual's economic and social positions relative to others, based on income, education, and occupation. Within this SES triad, occupation emerges as a pivotal element in the "process of stratification" (Blau & Duncan, 1967: Chapter 5) that connects income levels, educational requirements, and the degree of power or privilege held in society.

Occupations are not only central to how individuals are recognized and situated in society but also fundamental to sociological research on intergenerational mobility and reproduction. One key reason for this is that occupations are straightforward to report, even for someone else (e.g., a parent or spouse), making them particularly useful for studying patterns of intergenerational reproduction.

The pivotal role of occupation in the process of stratification has been extensively supported in empirical studies. Blau and Duncan (1967: 6) refer to occupational position as the "best single indicator" of social status. The significance of occupation in the social position of individuals has been further argued by Treiman (1970), who claims that occupation is key because it serves as a standardized way to compare stratification regimes across countries, which is essential for cross-national research. Parsons (1970: 24) also emphasizes that in industrial societies "occupation rather than property" has become the primary

determinant of household status, highlighting a shift in modern stratification systems away from traditional bases such as kinship and property ownership.

Occupation is key for delineating an individual's place within the social hierarchy because it is closely linked to both education and income levels. Its utility in tracking social reproduction and familial lineage over time is also due to its methodological benefits, as outlined by Sno and Ganzeboom (2017, 2019) who note occupation's measurability by proxy and its effectiveness in capturing both intergenerational and intragenerational dynamics. These characteristics make occupations "sensitive indicators of both social and individual changes" (Sno & Ganzeboom, 2019: 3), offering a consistent point of reference for longitudinal and cross-cultural studies.

A particular concern regarding occupation as the key indicator of social stratification is that not everybody has a (current) occupation (e.g., the unemployed, retired, disabled and homemakers) and that informal employment may condition the nature of the occupational situation. However, while not everyone has an occupation,[2] informal employment is still employment — and workers in informal occupations still have an occupation. In principle, the occupational classifications we use include both formal and informal employment. Unfortunately, the data we use do not allow for a strict separation of the two. However, we will test the inclusion of informal work using a proxy variable to better understand its relationship with occupational stratification.

In this research, we comprehend the essence of occupational status as being a single, unidimensional socioeconomic hierarchy. As Featherman, Jones and Hauser articulate "the common core and dominant dimension of occupational status is socioeconomic in nature" (1975: 331). In their comparative analysis of Australian and U.S. data they support the thesis that socioeconomic status is central to occupational stratification in all market-regulated societies. Building upon this argument, Featherman and Hauser (1976) assert that socioeconomic status of occupations (and not their prestige) serves as the most robust indicator for examining occupational mobility and the status attainment process.

2.2 Discrete Classes or Continuous Hierarchies?

Occupational status can be measured either categorically or continuously. Categorical, or 'class-based' approaches to social stratification conceptualize society as divided into distinct, nominal categories. The most prominent framework currently is the EGP class schema (Erikson et al., 1979), which uses an 11-category system based on work sector, skill level, self-employment, and supervisory roles to group occupations (Ganzeboom & Treiman, 2003: 163). This categorical view treats occupational classes as qualitatively distinct, rather than hierarchically ordered, with members of each class sharing specific employment and work conditions. The EGP typology has gained international recognition and has become a de facto standard for categorical stratification analysis in various countries. However, at the same time in different applications, the number and delineations of categories is often adjusted to country- and data-specific considerations, suggesting that occupational classes are less categorical and fuzzier than 'class theory' seems to imply. For instance, Rose and Harrison (2007) developed the European Socio-Economic Classification (ESeC) to standardize class schemas across European countries. While ESeC builds

[2] This important point was raised by an anonymous reviewer. The issue of non-employment is not unique to SEI scales but is also present in class and other continuous stratification schemes. Household-level data can help address this challenge, for instance, by averaging SEI scores across household members or applying dominance models for class schemes.

upon the EGP framework, it refines the classification rather than merely reproducing the original schema. Recently, Smallenbroek et al. (2024) critically assessed both the EGP and ESeC schemas, demonstrating their limitations in capturing class hierarchies consistently across diverse post-industrial societies and advocating for more fine-grained distinctions.

In contrast to class typologies, vertical scales of occupations are conceptualized in terms of incremental steps, offering a more granular picture of the stratification of workers. While SEI scales emphasize continuous hierarchies by concentrating on the two most important indicators of stratification — education and earnings — class typologies represent a categorized approach that incorporates multiple indicators, including labour relations, employment status, and contract type. While class typologies focus on employment conditions, SEI scales provide a measure of labour market processes: occupational recruitment and income attainment. While SEI offers finer gradations of occupational status and class frameworks incorporating broader relational dimensions of labour market structures, these approaches are not entirely distinct but empirically strongly related (Ganzeboom et al., 1992).

2.3 Prestige or Socioeconomic Status of Occupations?

An important alternative to socio-economic scaling of occupations are prestige ratings. The conceptualization of prestige comprehends the judgement people make on others' attributes (Treiman, 1977: 20), such as occupations. Prestige scales are a collective representation of these judgements. In this sense, occupations are rated independent from the subjective evaluation of people (Hauser & Warren, 1997). According to Treiman (1977: 60), the level of prestige of occupations generates power and privilege independently of socioeconomic status.

A long tradition of the study of prestige has developed since the first analyses of the data from the national survey of occupational prestige was conducted in 1947 in the United States by North and Hatt (Reiss, 1961) at the National Opinion Research Center (NORC). In the US, important updates of the NORC prestige scale have been developed by Siegel (1971), Nakao and Treas (1994) and more recently Hout et al. (2014). Building on this tradition, but using data from convenience samples, Hughes et al. (2024) recently introduced a comprehensive scale of occupational prestige for over 1000 occupations, including those listed in the US Department of Labor's O*NET database. Elsewhere, many national scales have been published, such as the one developed by Goldthorpe and Hope (1974) for England, and Carabaña Morales and Gómez Bueno (1996) for Spain. In the Latin American context, there have been efforts to develop occupational prestige scales tailored to specific countries. For instance, Acosta and Jorrat (1991) developed an occupational prestige scale for Argentina using survey data, whose sample consisted of 250 residents of the city of Buenos Aires, aged 25–64. More recently, Rey and Boado Martínez (2019) conducted the *Encuesta de Movilidad Social y Trayectorias Educativas* in Uruguay, including assessments of occupational prestige, from which they derived a scale.

The development of the first American SEI scale was closely connected to prestige measurement (Duncan, 1961). Duncan's aim was to derive prestige scores for all occupational titles, as he encountered a limited number of occupations in the NORC prestige data. In fact, prestige scores were only available for "less than half of the labour force" (1961: 110). Duncan's approach matched the NORC occupation titles with 1950 US census data. Then, he applied a model predicting NORC prestige scores using the education and income levels, controlling for age, and used these predicted scores to impute the prestige of

occupations that were not covered by the NORC scale. However, Duncan's original objective of producing prestige scores for all occupations (approximated by socio-economic scores) was not accomplished. Instead, Duncan found "an overwhelming socioeconomic basis to social prestige" (Featherman, Jones & Hauser, 1975: 332) as his SEI scores worked better than that of prestige. As a result, Duncan created the Socioeconomic Index (SEI), which became a pioneering effort to scale occupations according to their socioeconomic status and effectively replaced prestige scales in analysing the processes of stratification.

2.4 The Treiman Constant: Is it Constant Across Time and Space?

Prestige research has dealt with the inquiry about the invariance of the occupational prestige hierarchy within and between countries. Taking data from approximately sixty nations' ladders of occupational prestige, Treiman (1977) developed the thesis that occupational hierarchies are basically similar across all societies, no matter where and when they are produced. This conclusion is now commonly known as the "Treiman constant" (Hout & DiPrete, 2006), which allowed the construction on the Standard International Occupation Prestige Scale [SIOPS].

To explain the basic similarity Treiman (1977: 128) invokes two arguments, both referring to universal processes of stratification. On the one hand, Treiman argues, occupations world-wide have the same technological requirements, effectively demanding the same level and nature of education and training. On the other hand, these technological requirements determine the scarcity of adequately trained workers, making for similar earnings world-wide. Somewhat unintentionally, Treiman's argument refers to the two components of SEI scales. By implication, the Treiman constant should hold better for SEI scales than for prestige scales, an argument that is largely untested by current research.

Treiman's thesis on the cross-national similarity of occupational hierarchies has been a foundational contribution since the 1970s, primarily documented by prestige ladders across 65 societies. However, while Treiman's findings revealed strong correlations, they were far from perfect, leaving room for further investigation. It is important to note that Treiman's work did not address SEI scales, which focus on educational requirements and expected earnings of occupations rather than prestige. To date, there has been little effort to systematically test the cross-national similarity of SEI scales in a manner comparable to Treiman's work. The recent study by Sno and Ganzeboom (2019) on the peripheral country of Suriname provides a notable first step to this research program, which we aim to extend with our analysis of Argentina. Using the optimal scaling method developed by Ganzeboom et al. (1992), Sno and Ganzeboom (2017, 2019) developed an SEI scale for Suriname, the SRSEI. In addition, they used and developed the MTMM methodology to evaluate the quality of the SRSEI, relative to the ISEI, and found that using the country-specific SRSEI scale improves measurement quality of occupational status by almost 10%.

Our study engages with two strands of research: (1) the conceptualization and scaling system developed in Ganzeboom et al. (1992) and Ganzeboom and Treiman (1996), which emphasizes education and income as the determinants of occupational status; and (2) the use of the MTMM to test for the validity and reliability of the scaling as well as the comparative SEI analysis, following Sno and Ganzeboom (2017, 2019), to assess the robustness of occupational scaling in a new national context. Replication plays a central role in the cumulative development of social science research, ensuring that established methods remain robust, adaptable, and applicable across diverse contexts (Freese & Peterson, 2017). In stratification research, replicating occupational scaling methodologies is not

simply a matter of repeating prior work but an essential step in testing the generalizability of socioeconomic indexes across different labour market structures. By applying established methodologies to Argentina, this study contributes to the broader goal of evaluating whether SEI scales remain stable across countries.

2.5 ISCO and ISEI

SEI scores for detailed occupations have been constructed for several countries, always using education and earnings of workers as ingredients (Duncan, 1961; Blishen, 1967; Broom et al., 1977; Do Valle Silva, 1974; Stevens & Featherman, 1981; Klaassen & Luijkx, 1987). It was not until 1992 when Ganzeboom, De Graaf and Treiman launched the first International Socio-Economic Index (ISEI) which provided socio-economic scores for occupations for cross-national comparative analyses. They used data on education, occupation, and income from 73,901 employed men in 16 countries, and used ISCO-68 as the backbone. The ISEI was built as the optimal scaling of occupations, which mediates the relation between education and income, resulting in finely grained scores for 271 different occupation categories. The research found that the ISEI performed rather well compared to the EGP class typology and the SIOPS prestige scale. Ganzeboom et al. (1992) also validated the ISEI scale on national datasets and found ISEI to be better than a local SEI scale in four out of five countries.

The ISEI has been revised twice to aid researchers in capturing the dynamics of occupational classification. First, Ganzeboom and Treiman (1996) constructed a new version of ISEI (from now on referred to as ISEI-88), derived from ISCO-88. In 2010, Ganzeboom produced an update of the international index, called ISEI-08 (Ganzeboom, 2010). This version was constructed using data from the 2002–2007 International Social Survey Programme with almost 200,000 men and women from 42 countries.[3] The occupational titles were taken from the latest update by the ILO (2012), ISCO 2008. This study was a departure in SEI research due to the inclusion of women in the sample, making this index different from the previous versions of the International SEIs discussed above.

3 Argentina and SEI

There are two main reasons that make Argentina a particularly interesting case study to test the Treiman constant. First, Argentina — and many other countries in Latin America and the Global South — are underrepresented in comparative research on occupational stratification. The exclusion of countries from the Global South from both continuous and categorical stratification studies is problematic. While exceptions exist (Treiman & Ganzeboom, 1990; Treiman & Yip, 1989), Argentina has been largely absent from comparative studies that examined continuous stratification models. Similarly, categorical studies, such as the CASMIN project (Erikson & Goldthorpe, 1992) and its successors (Breen, 2004;

[3] This list of countries (Ganzeboom, 2010: Appendix Table 1) can be grouped as follows: Latin America (Argentina, Brazil, Chile, Mexico, Dominican Republic, Uruguay, Venezuela); North America (Canada, United States); Western Europe (Austria, Belgium, France, Germany, Ireland, Netherlands, Portugal, Spain, Switzerland, United Kingdom); Eastern Europe (Bulgaria, Croatia, Czech Republic, Hungary, Latvia, Poland, Russia, Slovenia); Scandinavia (Denmark, Finland, Norway, Sweden); Asia (Israel, Japan, Philippines, South Korea, Taiwan); Oceania (Australia, New Zealand), and Africa (South Africa). Notice that among these countries there are many from Latin America and the Global South.

Table 1 Predicting equation for CNO-based ARSEI

	Baseline for Character of work	ARSEI Coeff	N Cases
Managers, proprietors & government officials			
[dig12 = 00]	Officials of national, provincial, municipal and/or departmental executive power	37.4	93
[dig12 = 01]	Officials of national, provincial, municipal and/or departmental legislative power	37.4	8
[dig12 = 02]	Officials of national, provincial, municipal and/or departmental judiciary power	37.4	17
[dig12 = 03]	Directors of state agencies, companies, and institutions	36.2	141
[dig12 = 04]	Directors of social institutions	24.2	23
[dig12 = 05]	Executives of small and microbusiness	10.9	1506
[dig12 = 06]	Executives of medium sized private companies producing goods and/or services	22.1	566
[dig12 = 07]	Executives of large private companies producing goods and/or services	37.4	12
Administrators, legal professionals			
[dig12 = 10]	Administrative management, planning and management control	50.8	5327
[dig12 = 11]	Legal management	45.4	601
Budget, accountability & financial management			
[dig12 = 20]	Budget, accountability, and financial management	49.7	1744
Commercial & transport			
[dig12 = 30]	Direct commercialisation (traditional and telephone)	43.1	5634
[dig12 = 31]	Commercial brokerage, home sales, travelers and promoters	47.8	409
[dig12 = 32]	Indirect commercialisation (demonstrators, repositors and cadets)	52.1	405
[dig12 = 33]	Street and itinerant commercialisation	33.1	495
[dig12 = 34]	Transport	46.9	2596
[dig12 = 35]	Telecommunications	46.5	562
[dig12 = 36]	Storage of inputs, raw materials, goods and instruments	47.7	636
Education, science & security			
[dig12 = 40]	Health & sanitation	53.3	1890
[dig12 = 41]	Education	66.3	3400
[dig12 = 42]	Scientific and technological research	39.1	142
[dig12 = 43]	Consultancy occupations	41.3	148

Table 1 (continued)

	Baseline for Character of work	ARSEI Coeff	N Cases
[dig12 = 44]	Disaster prevention and attention to environment and ecology	55.4	137
[dig12 = 45]	Mass communication	46.8	236
[dig12 = 46]	Social, community, political, union and religious services	53.4	200
[dig12 = 47]	Surveillance and civil security services	41.1	720
[dig12 = 48]	Police services (federal and provincial)	59.4	824
[dig12 = 49]	Armed Forces, Gendarmerie and Prefecture	63.9	156
Service occupations			
[dig12 = 50]	Art	44.8	125
[dig12 = 51]	Sport	48.4	229
[dig12 = 52]	Recreation Services	54.2	136
[dig12 = 53]	Gastronomy service establishments	41.7	1690
[dig12 = 54]	Accommodation and tourism services	40.8	84
[dig12 = 55]	Domestic services	37.5	2968
[dig12 = 56]	Cleaning services (non-domestic)	45.1	2241
[dig12 = 57]	Care and attention of people	38.4	1406
[dig12 = 58]	Various services	41.3	683
Agriculture			
[dig12 = 60]	Agricultural production	23.7	228
[dig12 = 61]	Livestock production	32.9	51
[dig12 = 62]	Forest production	30.4	18
[dig12 = 63]	Beekeeping, poultry, and other minor species	30.4	16
[dig12 = 64]	Fishing production	36.9	33
[dig12 = 65]	Hunting	30.4	1
Mining & construction			
[dig12 = 70]	Extractive production	67.7	200

Table 1 (continued)

	Baseline for Character of work	ARSEI Coeff	N Cases
[dig12 = 71]	Energy, water, and gas production	62.5	101
[dig12 = 72]	Construction/infrastructure and energy, water, gas, telephone, and oil distribution	37.3	6122
Industrial production			
[dig12 = 80]	Industrial and artisanal production	44.1	3857
[dig12 = 81]	Software production	38.2	257
[dig12 = 82]	Consumer goods repair	38.1	1195
Mechanics			
[dig12 = 90]	Installation and maintenance of machinery, equipment & systems for production of goods	53.7	201
[dig12 = 91]	Productive technological development	53.3	2
[dig12 = 92]	Installation and maintenance of machinery, equipment & service delivery systems	53.1	469
Increment for Hierarchy			
[dig3 = 0]	Managers	+ 8.4	2366
[dig3 = 1]	Own account	− 12.7	9270
[dig3 = 2]	Boss	− 2.1	1183
[dig3 = 3]	Salaried worker	0	37,454
Increment for Technology			
[dig4 = 1]	Without machine operation	− 12.9	33,516
[dig4 = 2]	With operation of machinery and electromechanical equipment	− 12.7	5590
[dig4 = 3]	With operation of computerized systems and equipment	0	7618
Increment for Qualification			
[dig5 = 1]	Professional	+ 37.1	3983
[dig5 = 2]	Technician	+ 22.2	8289
[dig5 = 3]	Operative	+ 8.7	26,426
[dig5 = 4]	Non-qualified	0	11,575

A predicted score for ARSEI based on CNO codes is obtained as $\text{Baseline}_{\text{character}}$*(digit12) + $\text{increment}_{\text{hierarchy}}$*(digit3) + $\text{increment}_{\text{technology}}$*(digit4) + $\text{increment}_{\text{qualification}}$*(digit5)

Breen & Müller, 2020), have excluded much of the Hispanic world. This limited representation restricts the ability to compare stratification systems across diverse socio-economic contexts, which is crucial for generalizing stratification models.

Second, no local SEI has ever been developed for Argentina. Social stratification research in Argentina has a long tradition of studies on occupational class, with a categorical understanding of social stratification. The start of social class research on Argentina can be traced back to the 1950's, when Germani (1955); Germani & Jaime, (2022) conducted his initial studies. Germani designed a schema of 7 classes, which he called *niveles ocupacionales* ('occupational levels'; Germani, 1963: 340). Despite this hierarchical wording, Germani explicitly discarded the continuous approach to stratification because it "denies the real sociological existence of the social classes" (Germani, 1955: 133).

Germani's approach, framed within the lens of modernization theory and applying his own-developed class schemes, pioneered the analysis of stratification models using data from four national censuses conducted between 1869 and 1947 (Germani, 1955, 1963). Following this tradition, Torrado (1992, 1998) further explored the evolution of social class in Argentina, expanding the analysis through censuses taken between 1947 and 1980 and developing a class schema called *Nomenclatura de la condición socio-ocupacional*. This categorization ranged from an aggregated version of three broad classes to a most detailed version of 12 categories, including sub-groups within each broader class. Most recently, Sacco (2019) has contributed to this historical series of stratification analyses by using 1980–2010 census- and EPH-data, to update Torrado's class scheme. Germani's work, together with Torrado's (1992) and most recently Sacco's (2019) constitute an impressive historical series of analyses of the stratification of Argentina using census data and categorical classes. Ironically, two recent studies on social mobility in Argentina (Dalle et al., 2022; Jorrat et al., 2024) have bypassed the problem of Argentinean specificity by using the internationally standardized EGP categories.

All this scholarship understands occupational stratification as discrete categories. The one exception is the work by Acosta and Jorrat (1991) who constructed a prestige scale for occupations in Argentina. However, these authors did not provide a mapping of either CNO or ISCO into their scale; hence it was never used in analysing social structural data. According to our literature review, no socio-economic indexes of occupational hierarchies have been constructed for Argentina so far. Only by developing an Argentinean SEI scale, it can become clear whether Argentina's occupational hierarchy corresponds to the Treiman constant.

Until recently, officially published Argentinean data used only the national codes of occupations (in Argentina: CNO) but did not contain internationally comparable ISCO codes. However, recently three datasets have been published: EPH 2015, PISAC 2014 and PISAC 2021 (see detailed information in the Data section below), with double-coded occupation data. This makes it possible to address three gaps in stratification research on Argentina. First, continuous measures such as ISEI have not been utilized to study the occupational structure of Argentina, because many Argentinean data do not offer a matching to ISCO codes. Second, there is no way to know whether the CNO captures the occupational structure of Argentina more accurately than ISCO would do. Third, while other academic fields have provided significant insights into Argentina's social structure — such as economic research on income inequality and labour market dynamics (e.g. Beccaria & Groisman, 2015; Gasparini et al., 2011; Maurizio & Vázquez, 2015) — there are no sociological studies examining whether its occupational hierarchy aligns with global patterns, particularly within the framework of standardized measures like SEI.

Our research is an effort to exploit these recently available data to construct the first-ever SEI for Argentina and examine its properties relative to international measures. In sum, we address the following questions:

1. Can we construct a measure of socio-economic occupational hierarchy for Argentina (ARSEI) from the two available occupational classifications, CNO and ISCO?
2. What do we gain from constructing the ARSEI using a local classification (CNO) as a backbone rather than an international classification (ISCO)?
3. How does ARSEI compare to the internationally validated ISEI in representing the stratification process in Argentina, especially regarding the validity of the Treiman constant?

4 Data

To construct the ARSEI, we used data from the 2015 *Encuesta Permanente de Hogares* (Permanent Households Survey of Argentina; EPH 2015; INDEC, 2015a, 2015b) which has been carried out by *Instituto Nacional de Estadística y Censos de la República Argentina* (National Statistics and Census Institute of Argentina; INDEC) and is published on its official website.[4] The EPH survey was first launched in 1973, and is currently repeated every three months (INDEC, 2003).

Our data is an assembly of the first and second quarter's data files of EPH 2015, covering agglomerations from urban[5] areas of all the provinces of Argentina. In the EPH, the interviewee is the head of household, who provides information about all the household members. We analyse data from employed men and women aged between 21 and 64 with valid occupations codes, resulting in 50,947 cases. The data selections made are shown in Technical Table T1.

The units of analysis of our research are detailed occupational groups, coded into two different frameworks. On the one hand, the CNO, of which 494 (out of 594) occupational situations are observed in the EPH 2015 and, on the other hand, the ISCO-08 which organizes jobs into a classification of 436 titles of occupations of which 423 are effectively observed in the EPH 2015 data. As we will explain in more detail below, the logics of classifying occupational situations using CNO and classifying these same situations according to ISCO occupational titles are fundamentally different.

Two additional variables complete the status attainment model used to develop the ARSEI scores: education and income. For educational level, there are 7 categories which range from the lowest level measured, "without instruction", to the highest, "superior/university complete". For income there are 11 categories which classify the earnings of respondents into deciles,[6] which we converted into hourly wages.[7]

[4] https://www.indec.gob.ar/

[5] The restriction to urban areas implies that agricultural occupations are underrepresented. However, it is important to note that farmers and farm workers are not absent from the data we use.

[6] The 11th category refers to zero income, which we did not consider and made missing. Very few cases with valid occupation codes claim zero income.

[7] If hourly wages are not used, the income gap between men and women appears exaggerated because of gender differences in working hours. However, since incomes are reported in deciles rather than exact amounts, we could not calculate precise hourly wages. Instead, we calculated an approximate hourly wage by determining the mean income in pesos for each decile and dividing by hours worked.

For the validation we used data from the recent *Estructura Social de la Argentina y Políticas Públicas Durante la Pandemia por COVID-19*[8] (PISAC 2021; Dalle, 2022; Dalle & DiVirgilio, 2022a; 2022b), conducted in Argentina between 2019 and 2022.[9] Like EPH, this dataset contains detailed information on education, occupation, and income of household members. Since the PISAC occupations were also coded using both the CNO and ISCO-08, this data allows us to compare two scaling systems, with a total of 5239 cases. But most importantly PISAC 2021 offers occupational information on multiple occupations, also on respondent's parents,[10] which makes it possible to use the intergenerational association as a validation criterion.

4.1 Clasificador Nacional de Ocupaciones (CNO)

The first national occupational classification of Argentina, CNO 1974[11] (INDEC, 1974a, 1974b), distinguished 40 occupational situations, captured in two pieces of information about the occupation: its "character" and "qualification". Subsequent versions include CNO 1991, CNO 2001, and CNO 2017 (INDEC, 1994, 2001, 2017). CNO 2001 (INDEC, 2005a) features 594 and CNO 2017 (INDEC, 2018) includes 575 occupational situations. In this study, we will focus on CNO 2001, as this is the version implemented in the datasets EPH 2015 and PISAC 2021, which we analyse. CNO 2001 is a five-digit code that is composed of four pieces of information: character, hierarchy, technology, and qualification.[12]

Digit 1 and 2: Occupational character INDEC defines the occupational character as the dimension that classifies occupations based on the "type of object or product generated by the specific work process, regardless of the industry" (2001: 2). CNO-2001 uses two digits for this: the first digit represents the general occupational character (INDEC, 2005b: 351). This digit categorized occupations into 10 main groups (INDEC, 2005e), as follows:

- 0–5: Occupations related to service provision (e.g., management, administration, social services, arts, and tourism).
- 6–9: Occupations related to material goods production (e.g., agriculture, extractive industries, industrial production).

[8] Its formal abbreviation is ESAyPP/PISAC-COVID-19, but in this paper, we have simplified this to PISAC 2021.

[9] A previous version of this survey was held in 2014, called "*Encuesta Nacional sobre la Estructura Social*". For more information, see: https://www.argentina.gob.ar/ciencia/pisac/bases-de-datos

[10] The PISAC 2021 parental occupation refers to main provider, which is either father or mother (not both), but mostly the father.

[11] Its original name is CO-EPH (Clasificador Ocupacional de la Encuesta Permanente de Hogares), with later updates having names like CNO 2001 (Clasificador Nacional Ocupacional – Versión 2001). In this paper, we refer to CNO 2001 by default when using the term "CNO." If referring to other versions, we explicitly specify the year (e.g., CNO + YEAR).

[12] The newer versions, CNO 2001 and CNO 2017, significantly expanded the "character" groups (INDEC, 2001; 2017) and added the technology feature. Qualification requirements, with categories ranging between "professional" and "not qualified," are used consistently across versions, though older terms like "qualified" and "semi-qualified" in CNO 1974 are replaced in newer versions (2001 and 2017) by "technician" and "operative".

Each main group is further subdivided using the combination of the first and second digits, resulting in 52 sub-groups (e.g., administrative management, financial management, industrial production, and maintenance of machinery) (INDEC, 2005c).[13]

Digit 3: Occupational hierarchy Occupation hierarchy distinguishes "hierarchical-organizational relationships in work processes. It recognizes four categories: management, self-employment, supervision, and operational work" (INDEC, 2001: 3). The digit identifies these as "manager", "own account" ("*independientes*", independent), "boss" and "salaried worker" ("*ejecución directa*", operational work) (INDEC, 2005b: 353).[14]

Digit 4: Occupational technology Occupational technology is based on the technical-organizational forms of work. It identifies "the use of various technological forms that are present in different production processes for goods or services" (INDEC, 2001: 3). Occupational technology distinguishes between "Without machine operation", "With operation of machinery and electromechanical equipment" and "With operation of computerized systems and equipment" (INDEC, 2001:4).

Digit 5: Occupational qualification Occupational qualification "measures the complexity of the work process within each occupation" (INDEC, 2001: 4). It refers to the knowledge and skills required for performing the occupation, which results in the categories: "Professional", "Technician", "Operative", "Non-qualified", and "Unknown qualification".

As an example of CNO usage, doctors and nurses would be coded as in 40.3.1.1 and 40.3.1.2 correspondingly (INDEC, 2005f):

40HEALTH AND SANITATION OCCUPATIONS.
40.3 Health and sanitation workers.
40.3.1 Health and sanitation workers without machine operation.
40.3.1.1Professional qualification.
40.3.1.2 Technical qualification.
40.3.1.3 Operational qualification.
40.3.1.4 Unqualified.

Observe that neither "doctors" nor "nurses" are directly referred to in the classification. CNO codes occupations by Character, Hierarchy, Technology, and Qualification, which are useful attributes when it comes to sociological thinking about occupations but do not refer to occupations directly. These attributes are coded separately, as they come from different source questions in the survey and are then combined in the five-digit code. Therefore, the CNO digits are not nested. The four parts have no compelling order and might have been ordered in different ways (e.g., beginning with occupational hierarchy) without any loss of information, as they are independently generated.

[13] In the online Appendix A, we provide a full detailed list of the digits and their groupings, including labels in both Spanish and English.

[14] If INDEC considers updating the CNO, we would suggest adding an extra digit to capture informality explicitly. Informality is a defining feature of Argentina's labour market, deeply impacting its structure and dynamics. A significant portion of workers operate in informal settings, which differ substantially in terms of stability, protections, and income levels compared to formal employment. Explicitly distinguishing between formal and informal work within these categories would enhance the classification by ensuring it more accurately reflects the realities of Argentina's labour market.

4.2 International STANDARD Classification of Occupations (ISCO)

ISCO-08, developed by the International Labour Organization (ILO, 2012),[15] categorizes occupations into 10 major groups, 43 sub-major groups, 130 minor groups, and 436-unit groups. This nested structure allows coding at four levels of detail, with more digits in the ISCO code indicating greater occupational specificity.[16] The major groups are as follows:

0000 Armed forces occupations.
1000 Managers.
2000 Professionals.
3000 Technicians and associate professionals.
4000 Clerical support workers.
5000 Services and sales workers.
6000 Skilled agricultural, forestry and fishery workers.
7000 Craft and related trades workers.
8000 Plant and machine operators and assemblers.
9000 Elementary occupations.

ISCO uses a nested structure that groups occupations at different levels of specificity. For example, within the major group "Managers (1000)", there is a sub-major group "Chief executives, senior officials and legislators (1100)". This group is further broken down into a minor group "Legislators and senior officials (1110)" and within that, a one-unit group "Senior government officials (1112)". This system works like a set of nesting boxes, where the smaller units fit into progressively larger categories. Medical Doctors are coded with 2210, Professional Nurses as 2220, Associate Nurses as 3220.

Unlike CNO, where digits have specific meanings across levels, ISCO-08's interpretability is restricted to the major groups. These major groups are related but never identical to distinctions made in CNO. The first digit of ISCO-08's represents broad distinctions in required skills, such as between Professionals (2000) and Technicians and associate professionals (3000). It also separates workers who operate machines, like Craft and related trades workers (7000) and Plant and machine operators and assemblers (8000), from Elementary workers (9000). From a CNO vantage point, this major-group classification employs a combination of criteria, encompassing both distinctions in skill levels and variations in the nature of the tasks performed in occupational roles. Beyond the first digit, ISCO's subsequent digits do not carry specific interpretations and merely refine the upper-level classification. This nested structure has great benefits in classification and scaling procedures, allowing for meaningful aggregations to simpler variants (e.g., 3-digit codes), which makes ISCO very flexible to use if the underlying occupational information is vague or incomplete.

CNO and ISCO both classify occupations based on tasks performed and share dimensions like skills or qualification level and nature of work. However, they differ significantly in structure and information. It should also be noticed that the Hierarchy digit of CNO incorporates two attributes of the occupational situations, self-employment, and supervising status, that are not systematically covered by ISCO and matter a lot in the conceptualization of categorical occupational status measures, such as EGP and ESeC. These differences obstruct conversion ('crosswalks') between the two classifications at any detailed

[15] Earlier versions of ISCO were ISCO-58, ISCO-68 and ISCO-88. See: https://ilo.org.

[16] Like Ganzeboom and Treiman (2003), we adhere to the convention of adding trailing zeros to digits not available, which is to say, that instead of using number 1 for "Managers", we prefer to use 1000.

level (INDEC, 2005d). For instance, Sacco (2019) and Chávez Molina et al. (2020) use a harmonization from CNO to ISCO-88, but only at a crude 2-digit level.

5 Method of ARSEI Construction

The method of construction of ARSEI consists of eight steps, listed in Fig. 2.

First, we identify the distinct occupational categories OCC, ensuring that the number of individuals in each occupational category (Nk) is recorded and preserved. Second, we standardize education and income to harmonize units of measurement: zEDUC and zINC. This ensures that both variables are on the same scale and are comparable, with a mean of 0 and a standard deviation of 1. Third, we calculate ARSEIx by combining the standardized education and income scores using a weighted formula, where p is a parameter that varies between 0 and 1. Here, p represents the weight given to education and (1-p) is the weight given to income of the occupation holders.

Fourth, we aggregate ARSEIx by occupation, meaning that for each occupational category, we compute the average of the ARSEIx values across individuals, denoted as xARSEIx. Fifth, we applied the optimal scaling algorithm used for ISEI (Ganzeboom et al., 1992; De Leeuw, 1992; Schröder & Ganzeboom, 2014; Ganzeboom & Sno, 2017; 2019). It consists in regressing income on education and xARSEIx, which results in coefficients B1 and B2. This step is repeated iteratively by adjusting the weight p (from Step 3) until B1 reaches its minimum value, which indicates that the optimal weight has been found for combining education and income. The optimal weight for the two components was found to be 0.29 (p) and 0.71 (1-p), indicating a smaller weight for education and a larger relative contribution of income in the Argentinean context.[17] This resulted in B1 of 0.055 for ISCO-ARSEI and 0.070 for CNO-ARSEI, relative to a total effect of zEDUC on zINC of 0.35. These regression models are shown in Technical Table T2.

Last, we standardize xARSEIx to a z-score, resulting in zxARSEIx. Seventh, we constructed ARSEI using an anti-logistic transformation (Hauser & Warren, 1997) to convert the standardized values into a scale unit ranging from 0 to 100, with a Mean of 50 and a Standard Deviation of 21. This step produces the final ARSEI score, which represents the socio-economic index for each occupational category. Finally, in the eighth step, we impute ARSEI for occupational categories with small N ($Nk < 20$), using two different methods. For CNO-based ARSEI we used a predicting equation, whereas for ISCO-based ARSEI we used aggregation.

5.1 Imputing Scores for Rare and Missing Occupations

For CNO, each digit is an independent and meaningful piece of information. Unlike ISCO, where occupations are hierarchically nested and can inherit scores from broader categories, CNO requires another fix to provide scores for all its occupational classifications. To solve this issue, we estimated an additive predicting equation using dummy variables for the categories of each of the four components, i.e. 52 categories for Character, four categories for Hierarchy, four others for Qualification and five categories for Technology. The expected values from this predicting equation were used as an imputation in cases when

[17] The larger weight for education does not imply that ARSEI is much closer connected to education than to income, since this correlation is also driven by the homogeneity of education and income by occupations.

- Step 1: Define / construct occupational categories. Preserve Nk (N of each category).
- Step 2: Z-standardize Education and Income: zEDUC, zINC.

Iterative:

- Step 3: ARSEIx = p*zEDUC + (1-p)*zINC
- Step 4: Average ARSEIx by OCC → xARSEIx.
- Step 5: Regress zINC = B1*zEDUC + B2*xARSEIx.

Repeat with varying *p* until B1 reaches minimum.

- Step 6: Z-standardize xARSEIx → zxARSEIx.
- Step 7: Compute ARSEI = exp(zxARSEIx)/[(1+ exp(zxARSEIx)]*100.
- Step 8: Impute ARSEI for Nk < 20. See text.

Fig. 2 The ARSEI optimal scaling procedure. Each step represents one stage in the construction of ARSEI. Source: developed by the authors

a CNO category was not represented in the EPH data, or with less than 20 observations. This allows us to assign an ARSEI score based on similar occupations rather than leaving it unclassified. The number of cases in the EPH data affected by imputation is necessarily quite small (3.2%).

Table 1 reports the predicting equation for the CNO-based ARSEI score, which consists of two parts. The baseline is formed by the initial scores based on the first two digits of CNO, the Character of Work, in 52 different categories, which are grouped by their first digit. These baseline scores are then supplemented by increments for Hierarchy (digit3), Technology (digit4) and Qualification (digit5), each of which has a reference category. The coefficients of the predicting equation are useful to understand how ARSEI stratifies the Argentinean workforce. Consistently high scores are obtained by workers in Education, Science & Security, Administrators & Legal Professionals, Mechanics, and Service occupations. Low scores are for Agricultural occupations. Two categories have strikingly variable scores: Managers, Proprietors & Government Officials includes a large subgroup of Small Business Executives, that ranks lowest of all. There is also considerable heterogeneity in Mining & Construction, with the large group of construction workers scoring considerably lower than the remainder.

However, these scores for Character of Work are only the baseline, and the increments for Hierarchy, Technology and Qualification make enormous differences. The largest differences are produced by Qualification, with professionals obtaining almost 40 points more than non-qualified workers. Being a manager adds almost 9 points (relative to salaried workers), while own-account workers obtain a negative increment of −12.7. Finally, Technology also adds to the ARSEI score, but there is almost no difference between machine operators and workers without machinery, who both score negatively relative to those who work with computer equipment (Table 2).

To impute missing scores for ISCO based ARSEI, we exploited the hierarchical nesting of its digits, using the estimated value of the next higher level as an imputation. E.g., none of the four specific subcategories of Business services and administration managers (1210) referred to above was represented by more than 20 cases in the EPH 2015 file; therefore, all

four subcategories obtain the same, aggregate score. This type of imputation happened to 183 ISCO categories. Although this may appear to be a substantive number, it is to be kept in mind that the imputation logically affects only small — and empty — categories, and the total number of cases affected is quite small (3% of cases in EPH 2015).[18]

6 Validating ARSEI: Testing Validity and Reliability in Fresh Data

We assess the quality of our ARSEI measure using the Multi-Trait Multi-Method model developed by Sno and Ganzeboom (2017, 2019) to quantify and check for overfitting of our scales. We first compare the two ARSEI scales and then apply another MTMM model to compare each scale against ISEI-08 (Ganzeboom, 2010). MTMM analysis was originally developed in the 1950's to separate reliability and validity using correlations (Campbell & Fiske, 1959). The classical form of MTMM requires multiple traits measured by multiple measurements – in its original form three of each. Meanwhile, factor-analytic structural equation models with constraints have been developed, enabling MTMM analysis to be applied with only two traits and two methods. This flexibility makes it particularly suitable for examining intergenerational association with respect to occupation. In stratification research, where this intergenerational association is of key interest, as it measures (elative) intergenerational mobility. Occupations of spouses (homogamy) or across the life-course (intragenerational mobility) would have been an alternative one.

Figure 3 illustrates this model, where circles represent latent traits (true occupation scores) and rectangles represent observed variables. Five coefficients (***a***–***e***) will be estimated from the six correlations that exist between the four measures. Coefficient ***c*** refers to the true correlation between the two occupations, corrected for unreliability and invalidity. Measurement coefficients ***a*** and ***b*** (trait effects or factor loadings) indicate the degree to which the true scores are attenuated by random error (unreliability). Coefficients ***a*** and ***b*** are constrained to be equal between the two latent constructs, to reflect that both occupations refer to the same socio-economic status. Finally, residual correlations ***d*** and ***e*** represent method-effects which indicate the degree to which the two occupations correlate depending upon the specific measurement used. It is a matter of taste, whether one interprets method-effects as systematic measurement error (invalidity) or multidimensionality. While the two traits – two methods model appears to be overidentified at first sight (5 coefficients to be estimated from 6 correlations), it is in fact not. However, identifiability can be achieved by invoking auxiliary variables (such as education and earnings) which can be regarded as perfectly measured.

Having created the ARSEI scale on the large-scale EPH dataset, we have chosen the recent PISAC 2021 data to examine the performance of both the CNO- and ISCO-based ARSEI, also relative to the international ISEI scale. While the PISAC dataset is considerably smaller than EPH, it is of sufficient size (N = 5239) for validation purposes. Crucially, it differs from EPH because it contains CNO and ISCO measures for multiple occupations, in particular respondent and respondent's parents' occupation. The MTMM model uses the association between these two occupations as a validation criterion, basically by estimating how different methods of measurement render this correlation.

We estimate the MTMM model in the two traits–two methods version, as displayed in Fig. 3. This model has been identified by adding auxiliary variables, for which we

[18] The full ISCO-08 classification with associated ARSEI scores is shown in the online Appendix B.

Table 2 Informal employment by occupation (ISCO-08) for 8 occupations in which informal work is most prevalent. Source: PISAC 2021

	N	% Informal
9111 Domestic cleaners and helpers	369	73.4
5223 Shop sales assistants	297	42.8
5311 Childcare workers	103	77.7
7112 Bricklayers and related workers	164	31.7
5322 Home-based personal care workers	112	44.6
9412 Kitchen helpers	46	69.6
9112 Cleaners and helpers in office, hotels, and other establishments	112	25.0
5131 Waiters	51	47.1

chose education and income. We prefer a 2 × 2 MTMM design over evaluating the three indicators at the same time, because in a 2 × 2 design the external relationships determine the relative size of the measurement coefficients.

The MTMM results (details provided in the Technical Table 5 in the online Appendix) reveal little or no systematic (= correlated) error in any of the measures, and the only substantial differences is found in the measurement coefficients, that are a function of the amount of random variation associated with each measure. We find the following measurement coefficients: CNO-ARSEI: 0.917, ISCO-ARSEI: 0.884 and ISEI: 0.947 (SE's are around 0.015). These coefficients can be interpreted as the amount that true correlations with occupational status are attenuated when researchers use one of the measures. There are three conclusions to be drawn from the analysis of these coefficients:

1. The differences in measurement quality are very small, although statistically significant.
2. CNO-ARSEI performs slightly better than ISCO-ARSEI, but the international ISEI outperforms both.
3. None of the three measures is perfect, as all of them are significantly different from 1.0.

To illustrate the differences further, Fig. 4 shows a four-variable status attainment model (based on models shown in Technical Tables T4 and T5), connecting parental occupation, respondent's education, occupation, and earnings. The main coefficients are given in four versions, the first three corresponding to the three methods of measurement separately, and the last from a model that exploits all three measures in a latent-variable measurement model. The fourth coefficient can be interpreted as a full correction for attenuation due to random components in the measure and can be regarded as a benchmark.

Despite the small differences in quality of measurement between the three methods, we still see differences in how the three scalings render the status attainment relationships, however at different places in the model. The simplest coefficient to evaluate is FMOCC ➔ EDUC, as it is not tampered by confounding or mediation. ISEI comes closest to the benchmark and here CNO-ARSEI is better than ISCO-ARSEI. For the EDUC ➔ OCC relationship ISEI also comes out best, but here ISCO-ARSEI beats CNO-ARSEI. When we turn to the respondent's income attainment part, we see that CNO-ARSEI comes out best, with stronger OCC ➔ INCOME and weaker EDUC ➔ INCOME.

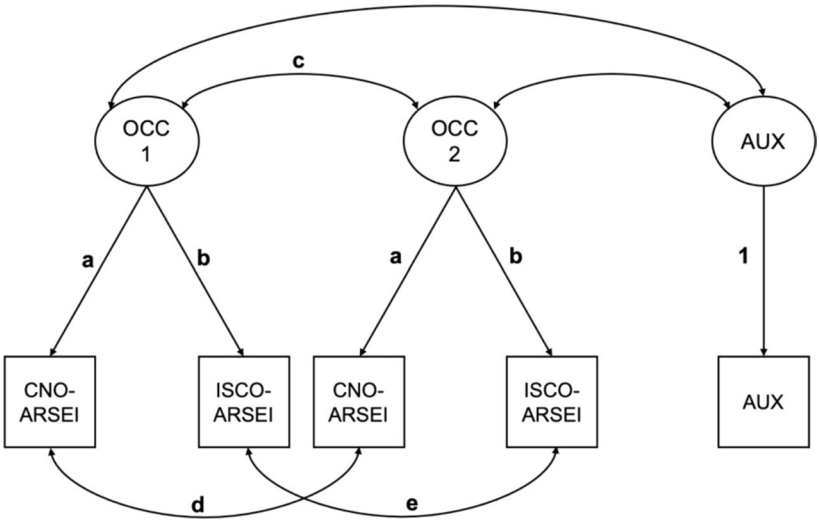

Fig. 3 The MTMM validation model. Boxes represent observed variables; circles represent latent variables and arrows represent direction of the causal relationships between these variables. Source: developed by the authors, after Sno and Ganzeboom ()

To provide more detail about the comparison of scales, Fig. 5 illustrates the strong relationship between ISCO-ARSEI and ISEI, using ISCO submajor groups as a backbone. At this aggregated level, the correlation is remarkably high (r = 0.95). The disaggregated scalings (not shown) provide much finer distinctions but their correlations remain strong, close to 0.90. Importantly, no significant outliers are observed in the scatterplot, reinforcing the idea that the differences between the two measures are largely due to random noise. However, while the scatterplot is informative, it cannot tell us whether the amount of random noise is different across the two measures. To address this, the measures must be subjected to a formal validation procedure using external variables, such as reported above, which allows us to evaluate their respective levels of precision and reliability.

7 The Socio-Economic Status of Informal Work

One important characteristic of the Argentinean labour market is the high prevalence of informal employment, defined as being employed or self-employed without a contractual agreement, often accompanied by irregular and uncertain pay. This phenomenon is a key feature of labour market heterogeneity in the region, as highlighted by Solís et al. (2019), who emphasize the association between labour market positions and living conditions in Latin America. Unfortunately, our data do not have a clear-cut indicator of informal employment, but they do provide a reasonable proxy, i.e., being in an employment situation in which no pension contributions are included as part of pay. It is important to note that we regard informal work as an employment situation, not as an occupation. Informal employment can occur across many occupations but tends to be more prevalent in certain ones.

Informal employment is typically characterized by a lack of legal protections, absence of social security benefits and job instability. In this study, we define informal

employment based on whether workers contribute to a pension system. This approach allows us to distinguish between formal and informal workers in a way that is both conceptually meaningful and empirically feasible using available information in our data. Individuals who do not report pension contributions are classified as informally employed, while those who do are considered part of the formal labour market. While this proxy captures a key aspect of informality, we recognize its limitations. It does not fully account for informal, self-employment or underreported labour arrangements, where individuals may work under informal conditions despite nominal pension coverage. According to the PISAC 2021 data approximately one-quarter (22%) of all gainfully employed Argentinean workers are in this informal category. The list of occupations that harbour most informal workers is unsurprising:

Because informal employment clearly is more prevalent in some occupations than others, being in informal employment is moderately correlated with the ARSEI of the occupation ($r = -0.31$). In a multivariate analysis, controlling for education and gender, informal workers have occupations that score on average about 10 points ARSEI less than workers in formal arrangements. This means that ARSEI is sensitive to differences between formal and informal employment to the extent that informal work is concentrated in lower status occupations.

It can be argued that informal employment should be part of the 'work and market situation' that occupations units are supposed to cover, and which SEI scales attempt to represent via education requirements and typical earnings of the occupations. A better way to account for the position of workers in informal employment would be to add informal employment as an additional digit to the CNO classification. This would be an interesting venue for future research, but we are not sure that such an attempt should be undertaken with the current proxy indicator that is available in our data.

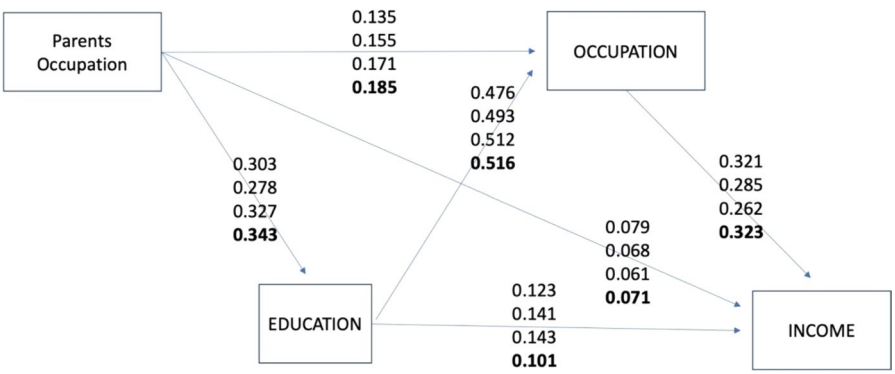

Fig. 4 Intergenerational status attainment model with four different measurements of occupational variables, PISAC 2021, N = 5239. Coefficients refer to: CNO-ARSEI, ISCO-ARSEI, ISEI, latent-variable measurement. Standardized coefficients. RMSEA = .053, p close < 0.217 (for latent variable measurement). All coefficients are statistically significant. Typical SE on standardized effects is 0.015 or lower

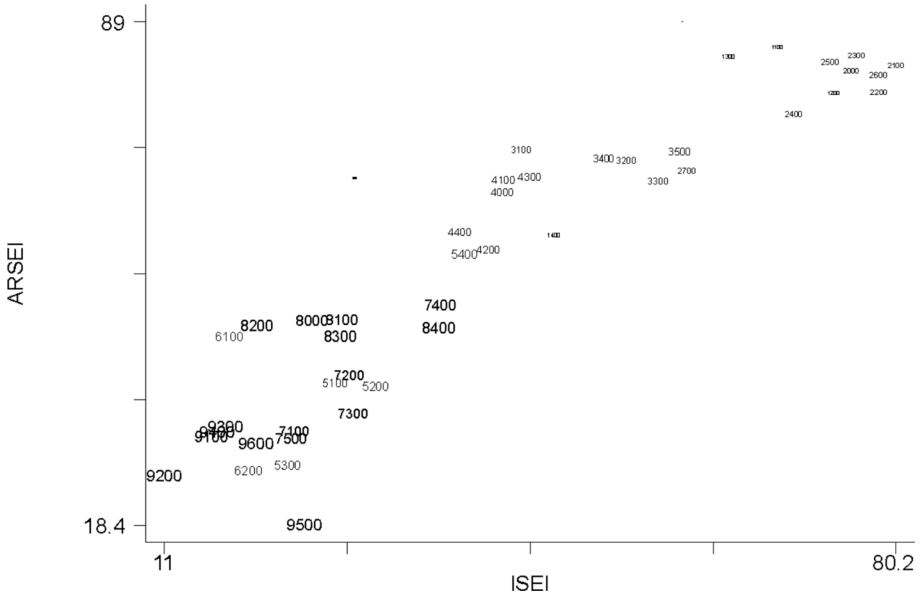

Fig. 5 Comparison of ISEI and ARSEI scores for ISCO-08 sub major occupational groups. The figure presents the relationship between the two indices, showing a strong correlation (r = 0.95), indicating a high degree of similarity in occupational stratification as measured by both scales

8 Differences in Socio-Economic Status Between Men and Women

One vexing problem of occupation scaling is the position of men and women. Like anywhere in the world, many occupations in Argentina are gender-typed. Using educational requirements and typical earnings to scale occupations could lead to different results for men and women, if these education requirements and typical earnings would be different between men and women. This is of most concern for earnings, as it has been amply demonstrated that women are paid less for the same occupations than men. In a scaling procedure that includes both men and women, this gender pay-gap becomes part of the scaling — leading to the risk that the pay-gap is underestimated if SEI is used to control for the status of the occupation. (This was the argument why Ganzeboom et al., (1992, 1996) used only men to scale occupations in their original ISEI construction.) We can examine the size of this potential bias in a regression model that estimates the gender pay-gap with and without controlling occupation.

Interestingly, our testing data — PISAC 2021 — finds only a small pay-gap in Argentina, with women making 7% less pay than men when controlling education, number of hours worked and parental occupation. When we subsequently control occupational characteristics (informal employment, ARSEI), this reduces further to 3% and becomes non-significant in the PISAC data. This could be interpreted to mean that the ARSEI scale has indeed built in the gender pay-gap, which makes it less useful to examine the gap. However, we observe that most of the reduction in pay-gap estimates is due to women's selection into informal employment, which is associated with almost 23% less pay than formal employment. We conclude that ARSEI has a slight tendency to obscure the gender pay-gap

and recommend research on the pay-gap to compare results controlling ARSEI to results controlling detailed occupation.

Another way to examine male–female differences in ARSEI performance is to compare status attainment models between men and women. This analysis (reported in detail in the online Technical Appendix) reveals some interesting differences, all of which suggest that ARSEI may perform better for women than for men. Women have slightly lower ARSEI scores than men (−2.4) when women's higher levels of education are considered, highlighting ARSEI's ability to capture gender disparities in the labour market. A striking difference between men's and women's status attainment further is that education is much more closely related to occupation for women than for men. This difference in occupational returns on education explains why women's occupation is also more strongly associated with parental occupation than men's: the gender difference in intergenerational reproduction disappears once education is controlled. These observations on gender differences in intergenerational occupational reproduction and status attainment are both interesting and plausible, suggesting that ARSEI is a valid measure for both men and women.

9 Conclusions

This study has developed the first-ever Socio-Economic Index of occupational status for Argentina (ARSEI), in two versions: one built upon the CNO classifier, and another based on ISCO-08 codes. Our findings demonstrate that a robust measure of socioeconomic occupational hierarchy could be constructed. To ensure that ARSEI can be easily adopted and applied by researchers and policymakers, we suggest utilizing the continuous ARSEI scaling as made available through online Appendices A and B. To facilitate this, we have attached machine code necessary for implementing these scales directly into statistical programs.

When comparing ARSEI to the internationally validated ISEI, we found that ISEI generally performed closer to the benchmark in status attainment models.[19] However, ARSEI, particularly CNO-based, effectively captured features of Argentina's labour market, which are shared with the Global South. These include the wide presence of informal work, which is concentrated in lower-status occupations, as well as gender dynamics, with women's occupational status showing a stronger link to education and a greater influence of parental education. The testing results using PISAC 2021 data suggest that the Treiman constant holds in Argentina to a strong degree, as the occupational stratification patterns remain stable across contexts. This highlights Argentina's alignment with global stratification patterns observed across 42 ISSP countries, reinforcing its validity as a comparative case within the broader international framework. However, further research is still needed to assess the full applicability of the Treiman hypothesis in Argentina and other Global South contexts.

[19] In this context, 'benchmark' refers to the latent variable measurement model used in the analysis. This model represents the 'true' relationships between variables (such as parental occupation, education, respondent's occupation, and income) if effects were corrected for attenuation caused by noise in the measurement instruments.

10 Discussion

The development of ARSEI has made a significant step in capturing occupational stratification in Argentina, providing a tool tailored to the country's labour market. However, we identify three key areas for future research that could enhance ARSEI's robustness and applicability. First, the entire construction process of ARSEI should be revisited using a larger dataset. This would allow for a more thorough evaluation and refinement, which could enhance its applicability for both national and international comparisons. This step is key for testing the Treiman constant more rigorously in the Argentinean context, as a larger sample would provide better insights (e.g. larger occupational groups) into the stability of occupations across generations. Second, testing ARSEI's validity should be tested with additional stratification processes, such as occupational homogamy and continuity in occupation careers, as this would offer a more comprehensive understanding of its effectiveness in capturing social patterns. In particular, understanding how ARSEI performs in intragenerational occupational reproduction studies could yield key insights into Argentina's labour market stratification. These areas are crucial for determining how well ARSEI reflects broader patterns in social stratification literature. Third, extending the ARSEI to future and earlier versions of CNO would allow researchers to test the Treiman constant for Argentina across time. This could be done in two different ways: (A) by identifying datasets coded with older or newer versions of CNO and developing ARSEI from these classifications or (B) by recoding CNO digits into earlier or later versions of the code. These limitations suggest that while broader patterns of stratification in Argentina align with international trends, as posited by Treiman constant, the Argentinean context may have important socio-economic dynamics that remain underexplored in conventional classifications. Thus, although our findings tie into broader discussions in the social stratification literature (Ganzeboom, 2010; Treiman, 1977), we acknowledge that the full complexity of Argentina's occupational structure requires further investigation.

Given the diversity of occupational classifications across countries, it is essential to consider the appropriate use of ARSEI in both national and comparative research. Either the CNO-based or ISCO-based ARSEI version could be used without converting between the two classifications, as direct conversion is not fully feasible. It is important to select the right ARSEI version. For national comparisons, the CNO-based ARSEI should be used, as it better captures Argentina's occupational context. For international comparisons, however, the ISCO-based ARSEI is more appropriate.

The implementation of ISCO classifications plays a crucial role in enabling cross-country comparisons of socioeconomic status. When addressing questions of socioeconomic status itself, such as how a particular occupation ranks within a country's socioeconomic structure (e.g., whether a teacher ranks higher in Argentina than in Australia), SEIs developed with common instruments like ISCO provide the basis for comparison. This approach harmonizes occupational detailed occupational categories, improving the comparability of findings across different countries. By incorporating both local and international perspectives, our work ensures that Argentina is well-positioned for meaningful participation in global stratification research. Moving forward, ARSEI offers a valuable tool not only for enhancing socioeconomic research in Argentina but also for contributing to a broader understanding of occupational hierarchies in the Global South, helping bridge the gap in cross-national studies of social stratification.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s11205-025-03582-1.

Author contributions Authors declare that previous work on this topic was conducted by Author 1, who developed author 1's MA thesis under the supervision of Author 2. Further details will be provided in the final manuscript, in line with the request for transparency and completeness.

Data availability The data supporting the findings of this study are available at https://osf.io/9axjq/?view_only=b987030791ff4afc81679c5366742f4c. The repository has been anonymized to comply with the requirements of double-blind peer review.

Declarations

Conflict of interest The authors declare no potential conflicts of interest, financial or non-financial, related to the content of this research.

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