Changes in Seam Effects Magnitude Due to Changes in Question Wording and Data Collection Strategies: An Analysis of Labor Force Transitions in the PSID

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Abstract

A seam effect occurs in panel studies when within-wave changes are less frequent than between-wave changes (comparing data gathered from two different interviews). Seam effects impact virtually every longitudinal study, no matter the mode of data collection or the length of the reference period.

This paper explores the changes in the magnitude of seam effects among labor force states (employment, unemployment, not in labor force) using the last seven waves of the Panel Study of Income Dynamics. The panel underwent several changes: data were collected with conventional questionnaire (CQ) for the first five waves. The interval between waves was moved from one year (wave one and two) to two years (following waves). In the waves six and seven the data regarding labor force transitions were collected with Event History Calendar (EHC) on a two year reference period. The questionnaire was also changed: one modification took place when moving to the two year reference period and the second when moving to EHC data collection.

Results show an increase of the magnitude of seam effect when moving from one year to two year reference period. A new undocumented phenomenon was found in the data. When moving to the two year reference period in the CQ waves, a within-wave seam effect appeared, that is seam effect between the first year and the second year of the two-year reference period. This effect was not found in the EHC two-year reference period. EHC also slightly decreased the magnitude of seam effects. The results are discussed in light of theories of seam effects, questionnaire design, and with references to the literature on EHC and CQ.

KEY WORDS: seam effect, PSID

1. Introduction[1]

A seam effect occurs in longitudinal studies when within-wave changes are less frequent than between-wave changes (Kalton & Citro, 1993; O'Muircheartaigh, 1996). Until now, seam effects have typically been observed in panel data collected using a standardized conventional questionnaire (CQ). Although some interviewing strategies have been shown effective in reducing seam effects (e.g. dependent interviewing), the effect of the Event History Calendar (EHC) method on seam effect has not been tested yet. This study benefits from a change in data collection strategies of the Panel Study of Income Dynamics (PSID). The PSID collected data using conventional questionnaires until the 2001 wave, and switched afterwards to EHC for a subset of questions. In this study seam effect is analyzed for labor force transitions for seven waves of the PSID starting from 1995 up to the 2005 data collection.

2. Labor force transitions rates

Seam effect is just one of the biases encountered when analyzing labor market dynamics in panel studies (Paull, 2002). Econometricians are especially interested in the seam bias because when Labor Force Surveys (LFS) collected with a panel design are used to study labor market dynamics, most of them show that reported changes in status tend to cluster at the seam at a higher rate than within the wave[2].

In order to study labor market dynamics, individuals are coded into one of three mutually exclusive states for each month: employed (E), unemployed (U), and not in the labor force (N). Even if it is possible for an individual to be legitimately in two or three states in the same month[3], many authors do not discuss this possibility,

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[2] Not all LFS show seam effects. For example the Current Population Surveys asks respondents to report their job status only referring to the calendar week before the interview and not for the entire reference period, that is one month (Current Population Survey, 2002). Because of this design, there are no within-wave data thus precluding the computation of possible seam effects.

[3] It is the case, for example, of switching between employment and unemployment in the same month because the two events occurred at different weeks of the same month.

while some follow certain rules, for example, giving priority to E over U and to U over N when more than one state takes place in the same month (Cotton & Giles, 1998). The combination of states show the *status change* from one month to the next one, resulting in nine pairs of codes, as delineated in Table 1.

Table 1. Possible Combinations of Mutually Exclusive States in Labor Force Status

		Month m+1		
		E	U	N
	E	EE	EU	EN
Month m	U	UE	UU	UN
	N	NE	NU	NN

After each subject is classified in one state for each month, different rates can be computed. In the LFS literature, the status changes on the diagonal of Table 1 (EE, UU, NN) are referred to as *stayers* (stay rate) or *non movers*. These people maintain the same status from one month to the next. The remaining six transitions are referred to as *movers*.

3. Current investigation of seam effect in LFS data

Although seam effects are observed on different kinds of variables (Burkhead & Coder, 1985), this review will focus on LFS data only. The first application of seam effect analysis to labor force transitions was done by Martini (1989), using the Survey of Income and Program Participation (SIPP). Seam effects with SIPP labor force transitions were subsequently studied by Martini and Ryscavage (1991) comparing the SIPP to the CPS transition rates.

Lemaître (1992) reported an increase of three to four times in the number of transitions in and out of self-employment at the seam when compared to the rest of the months using the Canadian Labor Market Activity Survey (LMAS). All the six movers transitions in the LMAS were later studied by Cotton and Giles (1998) who found seam effects for most of each of the transitions. Torelli and Trivellato (1993) showed strong seam effects for unemployment duration spells in the Italian Labor Force Survey. Seam effects for inflow and outflow transitions are found by Kraus and Steiner (1998) in the German Socio-Economic Panel (GSOEP). Similar results have been found in the European Community Household Panel (ECHP) (Fisher, Fouarge, Muffels, & Verma, 2002) and in the Household, Income and Labour Dynamics in Australia (HILDA) (Carroll, 2006).

4. Event History Calendar data collection methodology

The Event History Calendar (EHC) method is a relatively new data collection technique that originates from the Life History Calendar (Freedman, Thornton, Camburn, Alwin, & Young-DeMarco, 1988). An EHC interview is centered around a customized calendar that shows the reference period under investigation (Axinn, Pearce, & Ghimire, 1999). The calendar contains timelines for different domains, for example work history, residence history, household composition and other domains relevant to the topic of the study. Landmark events, such as holidays and birthdays are noted in the timelines to aid respondent's memory. The interviewer guides the respondent in filling out each timeline, starting with the landmark events and continuing down until all domains, which constitute the focal points of the study, are completed. The process uses information and dates for each completed domain to help the respondent correctly place other events in the appropriate time frame. If, for example, the topic of the survey is unemployment history, respondents can use retrieval cues from their landmark events, residence history, and household composition to retrieve the period in which they were unemployed. For instance, an unemployment period can happen before a move to a new location or after a pregnancy. Interviewers follow a script where although the order of the questions is suggested in advance, it can be adapted to the respondent's recollection process (Belli & Callegaro, in press-a, in press-b).

5. Hypotheses

The EHC interviewing method gives respondents more retrieval cues than those available in a CQ. EHC uses different memory retrieval strategies at once, such as the use of landmarks to anchor events on the timeline. The flexible interviewing style of EHC allows respondents to retrieve the events in the order with which they feel more comfortable. Parallel probing gives the respondents more retrieval cues because it takes advantage of the existence of interconnected thematic and temporal pathways that can be used to remember specific events (Belli, 1998). The structure of EHC, especially in its computerized version, highlights gaps in the timeline, alerting the interviewer to probe for them thus potentially reducing item nonresponse and Don't Know answers. Another indication that supports the theoretical framework of this paper comes from the conclusion of the seam effect paper by Rips and colleagues (2003, p. 552). They advance the hypothesis that techniques such as EHC might be successful in reducing seam effects.

Seam effects are created by the manner in which panel data are collected. Since memories for the most recent portion of one response period are compared and

linked to memories of the earliest portion of the next response period, it is likely than the latter are of less quality than the former. Because the methodological studies conducted so far indicate that EHC leads to better retrospective data in terms of amount and precision of the recall, the recollection of the earliest portion of the panel wave should be of better quality, thus reducing the spurious transitions that are created by seam effects. Moreover, previous studies suggest that what drives seam effects is the inability to report precisely when events happened. Since EHC interviewing aids respondents in locating the events more precisely on the timeline, it is hypothesized that this data collection method should contribute to the reduction of seam effects.

6. Data and Methods

To test the hypotheses of this study, a concatenated dataset for the 1995-2005 waves of the Panel Study of Income Dynamics was used (McGonagle & Schoeni, 2006; PSID staff, 2006). More specifically, the dataset for waves 1995-2001 was obtained from the PSID data center[4], an online resource that enables the user to create a customized subset and companion documentation of the public release data. For the 2003 and 2005 EHC data, a prerelease dataset was merged to the official release file.

The variables used for the analyses are employment questions aimed to measure monthly labor force status for the head and wife of the household. Figure 1 shows the waves used in the analyses and the reference period of each wave.

Figure 1 also indicates the methodology of data collection, CQ or EHC, and seam points. Seams 1 to 6 are the standard seams that occur when joining two waves of data collected at different years. A new element, the within-wave seam points (WWS) became available when the PSID started collecting data referring to a two year reference period in 1997 and are referred to the transitions between December of the first year $(T-2)$ to January of the second year $(T-1)$. In total, there are ten seam points that will be the object of analysis. In the following paragraphs, the key methodological information about the dataset is reported. This will enable the reader to better understand how the PSID measures labor status and who is answering those questions. More information about the sampling design, response rates, and the survey content are found in McGonagle and Schoeni (2006).

For the waves that are the object of this analysis (1995-2005) data were collected using computer-assisted telephone interviewing. Beginning in 2003, a computer–assisted Event History Calendar instrument (Belli, 2003) was integrated with the current CATI instrument (Blaise) and a major section of the questionnaire was administered that way.

The PSID defines family units (FU) as a group of people living together as a family. Each FU has one and only one *Head*. In a married-couple family the Head is considered to be the husband, unless the husband is severely disabled. The person designated as Head can change overtime. The person living with the Head is defined as *Wife* if legally married or *"Wife"* if cohabitant. Unlike other panels, such as the GSOEP or the EHCP where all members 16 and older are interviewed, PSID gathers information about all people residing in the FU but only one person responds per household. Interviews are for the most part conducted with the Head or the Wife ("Wife").

PSID collects labor force status data only about the Head and the Wife of each household. The questionnaire contains separate questions for the Head and the Wife. Because only one respondent is selected for the interview, the answers for the Head section could be self or proxy depending on who is answering and vice versa. The PSID attempts to interview either the Head or the Wife, so other household members are rarely used as proxy.

The questionnaire was the same for the waves 1995 to 1997 and 1999 to 2001 for events that happened the year before the interview, time $T-1$. When the PSID switched to a two-year data collection in 1997, the questions about the job status referring to two years before the interview $(T-2)$ were asked in a more simplified way, and not consecutively after the question referring to time $T-1$. Moreover, the "not in the labor force" question was not requested for time $T-2$.

In 2003 the PSID switched sections of the questionnaire from conventional questionnaire to computerized Event History Calendar. The labor force sections were part of the switch. There are many differences in comparison to the CQ data collection. Besides the entire EHC interviewing style, the scripts of the questions are different. First of all, the questions are referred to the previous two years at once and information about time $T-2$ is asked in the same section and not later in the questionnaire as for the 1999 and 2001 waves[5]. Second, the wording of the scripts is different and instead of asking *in which month(s)* the respondent was E, U, or N, it is asked *when* either of those events happened (*When was that?*). Third, questions regarding "not in the labor force" status were asked before the unemployment questions. Last, questions regarding a detailed description of the job (as in the CQ), and work missed because of sickness, vacation and strike were asked after the E, U, N status questions. In the results section these differences will be further considered.

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[4] http://simba.isr.umich.edu/

[5] Space limitations prevent to fully explain the differences in questionnaire design. The reader is referred to the complete questionnaires available at:
http://simba.isr.umich.edu/Zips/ZipMain.aspx

6.1 Variables and data treatment

Three variables were constructed for each month containing information about employment, unemployment and not in the labor force. Transitions within the "employed" category were not taken into account. The month to month transitions variables were created concatenating the three variables for month t with the three variables for month t+1.

A subsample of 2000 Latino families was excluded for the 1995 wave, on the basis that those families had been added in 1990 but were dropped after 1995. In 1997, a new sample of immigrants was introduced in the study, starting with 441 families in 1997 and reaching 511 in 1999. This sample was dropped from the analysis to keep consistent with the decision to drop the previous sample of Latinos. In 1997 the PSID also reduced the core sample from the nearly 8,500 families in 1996 to approximately 6,168 in 1997 (McGonagle & Schoeni, 2006).

Although it is possible that more that one status is legitimately present for each given month (e.g. being employed and unemployed in the same month), the analysis is performed on the net transitions (i.e. ignoring multiple transitions in the same month because unclassifiable)[6]. The focus is then on the nine possible transitions that were delineated in Table 1. Those consist of a 1995-2005 average of 97.8% (SD=1.7) among all possible transitions.

Because in the 1999 and 2001 waves a question about "not in the labor force status" (N) was not asked for time $T-2$, an imputation strategy[7] has been applied in order to obtain the N variable necessary to compute the transitions at the seam. Results from the CQ 1999 and 2001 $T-2$ transitions should be interpreted with caution.

Lastly, in order to make meaningful comparison across seam points, the age at the seam has to be investigated. If for example the panel is aging, it is more likely to have more transitions from employed to out of labor force (EN), at later waves. The PSID following and eligibility rules however avoid that. In fact, the mean age for the six seam points is not really moving in any meaningful direction for the 10 years object of investigation (the average is around 43.5 years of age).

7. Results

Figure 2 plots all the transitions from March 1994 to December 2004 of the movers. The graph shows the percentage of each of the six *movers* transitions (off diagonal transitions of Table 1) for each reference period among all nine possible transitions. The chart is built with unweighted data. A chart plotted with weighted data using the PSID person level weights up to the 2003 wave showed a very similar picture[8] (results not shown). Attrition in the PSID is very low (McGonagle & Schoeni, 2006) and, although it might have an effect at the seam, it is not considered to be the main source of error.

Figure 2 shows six interesting phenomena. First of all, the PSID is not exempt of seam effect for labor force data in the most recent 7 waves. Seam effect was first found in the PSID for variables such as unemployment compensations and food stamp recipiency (Hill, 1987). In order to test if the number of transitions at the seam (from December to January) is statistically different from the number November-December transitions before that seam, a test of marginal homogeneity was used[9] (Agresti, 2002). The test shows that all seam points are different from the November-December transition at a statistical significant level ($p < .01$).

Second, the magnitude of the seam effect computed for the reference period of one year is lower than for the two years data collection. The test of marginal homogeneity comparing seam 2 (1995-96) to seam 3 (96-97) does not support this observation.

We do however have to remember that the variable N for time $T-2$ was imputed. This pattern is further evidence to the findings by Hill (1987) showing that an increase of the distance between the two data collection waves corresponded to an increase of the magnitude of seam effect.

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[6] The problem with multiple transitions in the same month is that it is not possible to assess the temporal order. If somebody reports to be employed and unemployed in the same month, there is no way to know if this person was employed and then unemployed or unemployed and then employed. For this reason, multiple transitions within a month are unclassifiable. With the EHC the data are collected at a one third of a month level of detail thus reducing the number of unclassifiable transitions. When however the data are released, thirds of a month variables are converted to month variables to keep consistency with the previous data structure of the PSID, thus losing the level of details originally collected.

[7] A "N" status was imputed for the months in which the respondent reported to be retired. If the panel participant reported to be working in time T−2, the N status was imputed in the month where the respondent was not working and was not looking for a job.

[8] It is not possible to plot a chart with weighted data because the 2005 wave weights were not ready when the data analysis was performed.

[9] Because the answers of panel respondents are dependent, an appropriate test for two dependent samples (paired) with a multinomial outcome for ordinal data (nine possible transitions) is the test of Marginal Homogeneity. The null hypothesis states that the row and column marginal response distribution of the respondents to the seam and the November-December transition will be the same. The alternative hypothesis states that for at least one transition, the marginal distribution of the seam will not be equal to the marginal distribution of the November-December transition. The test is performed only with the subjects whose answers are present in both transitions. The test is an extension of the McNemar test for binary responses.

Third, a previously undocumented phenomenon appears in the data: the presence of within-wave seam effects (e.g. CQ_WWS_97_98 in Figure 2); that is, there are higher transition rates between December of the first year and January of the second year of the reference period (marginal homogeneity test significant) than in November and December of the first year, or January and February of the second year. The effects seem surprising at first, because the data were collected during the same interview. On the other hand, $T-2$ questions were asked separately from $T-1$ job status questions, later in the questionnaire, and in a more simplified way. The simplification of the questionnaire is more likely the strongest contribution to the within-wave seam effect because of the limited retrieval cues offered to the respondents in the CQ data collection. The within-wave EHC seams (e.g. EHC_WWS_01_02) are almost nonexistent (marginal homogeneity test not significant). In fact questions were asked concurrently referring to the two year reference period for E and N status, and for $T-1$ and then $T-2$ for the N status.

The fourth finding is that EN (purple line) and NE (green line) transitions are more sensitive to seam effect than any other transition. This is an indication of the difficulty for the respondent to separate the concept of "unemployment" from "not in the labor force" that, although clear in the official definition, have been proven to be difficult to comprehend for the respondent (Campanelli, Martin, & Rothgeb, 1991).

The fifth finding for this study is that the magnitude of the transitions at the seam of waves collected with EHC is the lowest of the two year reference period. The CQ-EHC seam point (hybrid) is lower than the previous CQ and slightly higher than the EHC seam. The test of marginal homogeneity supports this finding again with the caution that when comparing seam 4 (1998-99) to seam 5 (2000-01) we are using the imputed vales for N in the 1998-99 calculation.

Based on the previous hypotheses, the EHC seam effect was expected to be even lower than the one observed. In other words, it seems that the EHC was not able to further reduce the effects at the seam. This fact can be explained by multiple observations on the design of the study.

First, although in the analysis it was possible to control for some confounding variables such as the immigrant sample and the self/proxy answers, others remained present: the comparison of EHC and CQ seams is confounded by the wording of the questionnaire. In the CQ case, people were asked about employment, unemployment and out of labor force with months as response options (i.e. in which months during [previous year] were you working for [name of employer]). In the EHC case, the question wording required more precision in remembering the job history (e.g. when did you start and stop working for [name of employer]). When thinking in months intervals, the respondent can simplify the remembering thus reducing seam effects.

In addition, data might be affected by order effect; in the previous discussion of the CQ and EHC questionnaires it was noted how the N question was asked before the U question in the EHC and the other way around in the CQ. Also, in the CQ, specific questions about the job and time missed for sickness, vacation and strike were asked after the employment section while in the EHC they were asked after the entire E, N, U section. Asking these questions after the timing of E, U, and N could have given less retrieval cues to the respondents although in the EHC the interview is more flexible and it is easier to go back and forth on the timelines making adjustments as they come up. All these differences in question wording make the comparison between CQ and EHC problematic at best. The present study does not include a control group where the same question wording was asked in CQ mode or EHC mode. In this ideal case the net contribution of the EHC data collection methodology could have been studied with no confounding factors.

Last, the EHC within-wave transitions are smoother than the CQ transitions. As just mentioned, it is difficult to pinpoint the exact cause for this phenomenon because of all the changes in question wording and data collection. It is however worth noting that the nature of the EHC data collection and its calendar feature "invites" the respondent to be more consistent and to fill gaps in the timeline. This characteristic can be the cause of the smoothness of the within-wave transitions in the EHC waves.

8. Conclusions

Seam effects have been observed in different panels, with different reference periods and with different modes of data collection. All the papers written so far analyze data that were collected with a standardized conventional questionnaire. This study investigates the trend of the magnitude of seam effects in labor force data in the PSID from a data user point of view. The data provide further evidence of previous seam effect findings, specifically that seam effect intensifies at an increase of the reference period between two waves. The EHC seam effect was found of slightly less magnitude than the CQ seam effect. Based on the previous hypotheses the EHC seam was expected to be even lower than the actual. An in depth investigation of the difference between the CQ and the EHC question wording is a tentative explanation for this finding. In fact, even though many confounding factors have been controlled for, the non experimental nature of the data precludes a clean comparison of the CQ-EHC seam effects.

The analysis showed a new phenomenon, the "within-wave seam effect", found when the PSID moved to a two year reference period. The within-wave seam suggests how questionnaire design can create seam effects

during the same data collection period. Supporting this idea, when the questionnaire was changed in the EHC waves, the within-wave seam disappeared.

PSID does not use any form of dependent interviewing. Since dependent interviewing is the strategy that has been proven most successful in reducing seam effect, it is plausible that if used in conjunction with EHC it will further aid retrieval, improving the quality of retrospective reports and further reducing seam effects.

Labor force surveys in panel data contain many sources of measurement error (Bound, Brown, & Mathiowetz, 2001; Lemaître, 1988). Some of those errors are magnified at the seam because every possible inconsistency between two waves shows up in the data. This paper provides evidence on how seam effect can be sensitive to changes in data collection strategies and questionnaire design. PSID users should be aware of possible seam effects in the variable analyzed and be careful when making interpretations of transitions at the seam of two waves.

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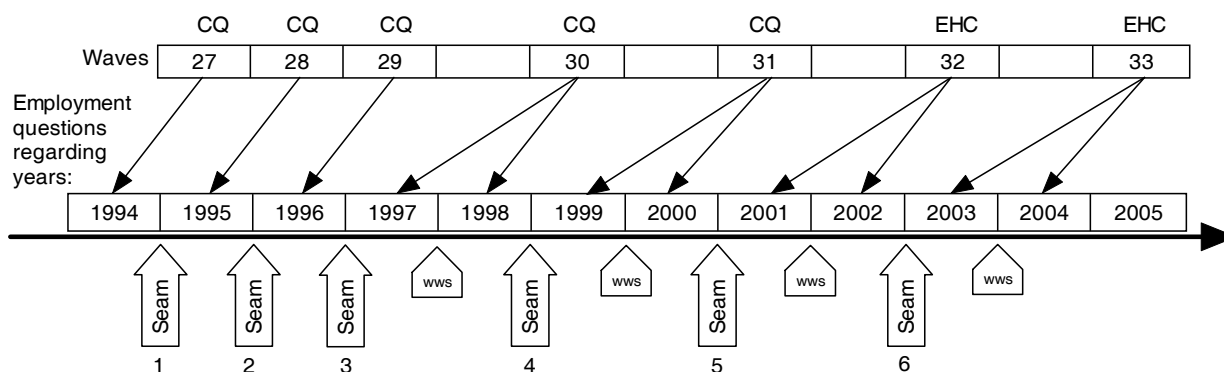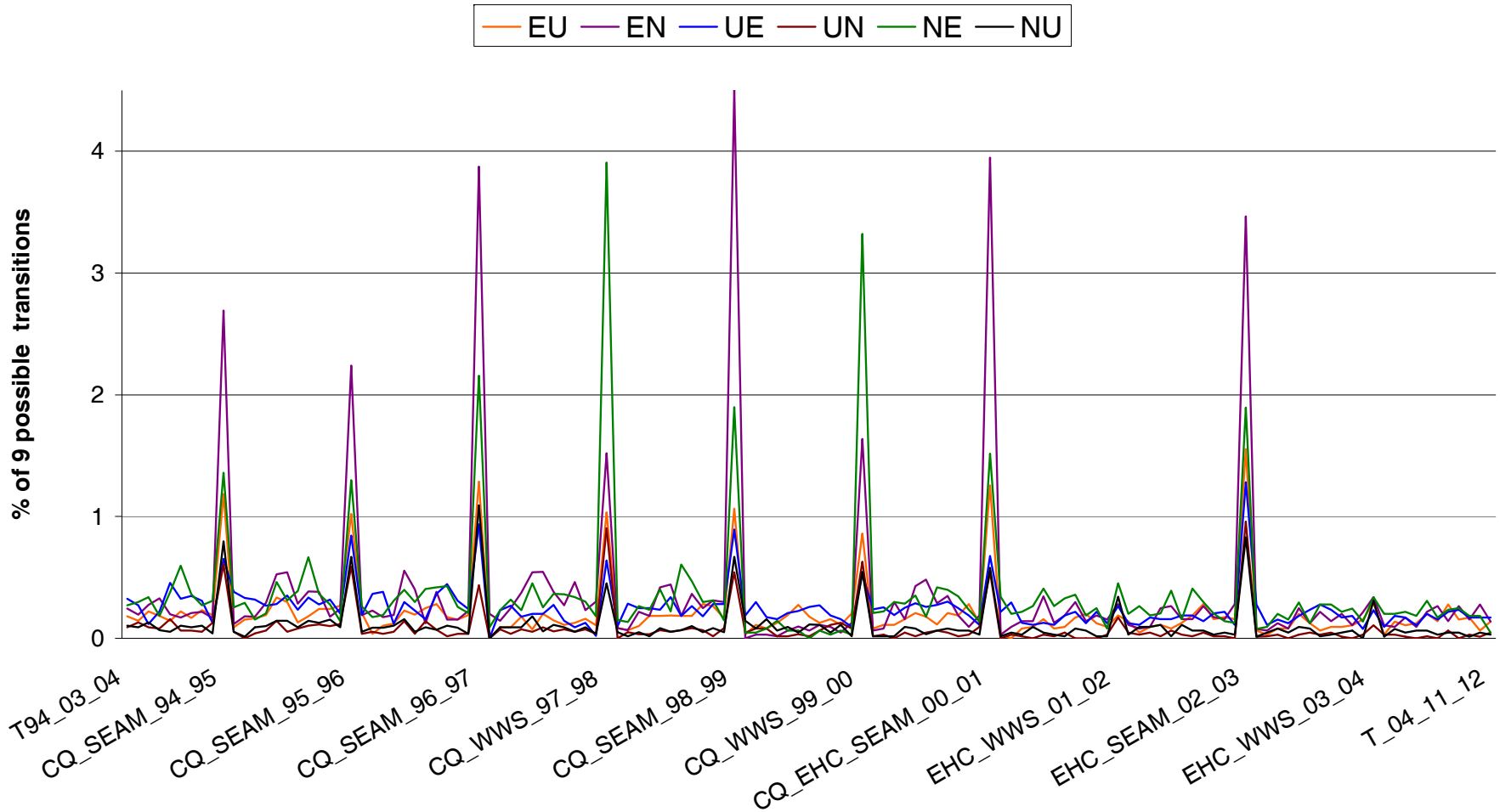

Figure 1. PSID Waves used in the Analysis and Seam Points.
Note: WWS = within-wave seam.

Seam 1995-2005 Self answers only, no immigrant samples

Figure 2. Month to Month Transitions of Movers in Waves 1995 – 2005, Self Answers Only, no Immigrant Samples

Note. The percentage of the 6 transitions of the movers is computed among the total number of the 9 possible transitions.

For better interpretation, the above picture should be printed in color.