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Expressive timing in expanded phrases: an empirical study of recordings of three Chopin preludes

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ABSTRACT: Empirical research on expressive timing in expert performance suggests that there is an especially close relationship between timing and phrase structure. However, this work has relied on rudimentary definitions of *phrase*, and has mostly been limited to examples with simple, symmetrical phrase structures. The present study seeks to move beyond these limits by engaging current theoretical discourse on phrase structure and by exploring examples that involve asymmetrical phrase structures arising from techniques of phrase expansion. The study concentrates on average tempo profiles across thirty recordings of Chopin's Preludes op. 28 nos. 1 (C major) and 3 (G major) and sixty-four recordings of no. 6 (B minor). Data were collected at the tactus level using a tap-along method in the case of the C-major and G-major Preludes, and using an automated beat-extraction algorithm followed by manual corrections in the case of the B-minor Prelude. Eight hypotheses regarding the relationship between phrase structure and expressive timing are extrapolated from these examples, and it is hoped that these might form a starting point for further research on expressive timing in complex phrase structures.

KEYWORDS: Performance theory; expressive timing; phrase structure; phrase rhythm; Chopin

CONTEXT AND OBJECTIVES

Two broad orientations can be identified in recent empirical writings on performance. One of these orientations emphasizes individual and historical differences in performance style (e.g. Cook, 2007; Fabian & Schubert, 2009; Leech-Wilkinson, 2009), while the other assumes that some aspects of performance expression are relatively stable and concentrates on building models of musical communication in performance (e.g. Todd, 1985, 1992;

Clarke,1988; Widmer & Tobudic, 2003; Friberg, Bresin, & Sundberg, 2006).[1] The present study takes the latter orientation; it is a contribution to the discourse of *performance theory*, as opposed to the discourse of performance history, and it makes use of empirical techniques of performance analysis in an effort to advance a theoretical (as opposed to a historical) perspective on performance.

There is mounting evidence of an especially deep connection between expressive timing and phrase structure; empirical studies have repeatedly shown that the tempo profile of a phrase tends to resemble an arch, with a slow beginning, followed by an acceleration, deceleration, and slow ending (e.g. Henderson, 1937; Gabrielsson, 1987; Shaffer & Todd, 1987; Repp, 1990).[2] This general tendency, which is sometimes called the 'phrase arch rule' (Friberg et al., 2006), is represented in an idealised fashion in Figure 1.[3] There are other aspects of phrase structure that influence expressive timing, most notably the melodic contour and the location of the climax (Timmers, 2007),[4] but the present study will focus on phrase arching only. More specifically, this study will concentrate on the final, decelerating portion of the phrase arch; it will focus on deceleration before, during, or after the structural ending (cadence). These decelerations will be regarded as transformations of 'phrase-final lengthening', the very common tendency of musicians (and also speakers) to decelerate near the end of a phrase.

1 Overviews of the extensive literature on generative approaches to expressive timing include Clarke, 1999; Gabrielsson, 1999, 2003; Widmer & Goebl, 2004. Lussy ([1874] 1892) is an early example of a generative approach; it offers an elaborate rule system that is supposedly based on observations at concerts given by a variety of leading performers (see Dogantan, 1997).

2 The components of the arch model — the slow beginning, acceleration, deceleration, and slow ending — are codified through a single algorithm in the phrase arch models (Todd, 1985; Friberg et al., 2006). Seemingly these components are thought to coalesce into a single expressive Gestalt. However, several empirical studies have suggested that the elements of the phrase arch can be found independently in some contexts. For example, Bruno Repp's principal components analysis of 115 recordings of the opening phrase in Chopin's Etude in E Major, Op. 10, No. 3, reveals that lengthening near the beginning of the phrase (at the initial downbeat) and at the ends of melodic gestures are two independent timing strategies, and that the latter tendency accounts for a much larger share of the variance in the timing data than the former tendency (Repp, 1998, pp. 1091-1093).

3 In the empirical literature it is customary to show inter-onset interval values (in milliseconds) on the y axis. In the interest of greater accessibility to musicians, IOI values will be converted to tempo values (in beats per minute) throughout this paper.

4 See also the discussion of 'residuals' – the expressive variance in a human performance that is not explained by Todd's (1992) model – in Windsor & Clarke (1997). Windsor and Clarke do not take the position that the existence of residuals undermines the validity of Todd's (1992) theory. Instead, their main point is that the model is more useful as a heuristic tool for the interpretation of real performances than as an explanation of real performances.

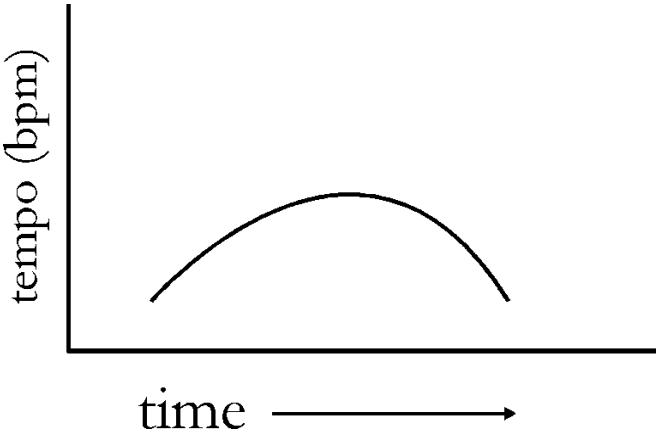

Figure 1. An idealised phrase arch

To date, the issue of *phrase expansion* has not been addressed in the discourse of performance theory, a discourse that has tended to make use of musical examples with relatively simple, symmetrical phrase structures.[5] This is perhaps because the topic of phrase expansion is not addressed fully in Lerdahl and Jackendoff's *Generative Theory of Tonal Music* (1983), the *locus classicus* for the analysis of phrase structure as far as most researchers in performance theory are concerned. (Lerdahl and Jackendoff do address several asymmetrical examples, such as the opening theme of Mozart's Symphony in G Minor KV 550, but they do not include a *taxonomy* of the techniques of phrase expansion.) More recent theoretical writings, most notably Rothstein's *Phrase Rhythm in Tonal Music* (1989), show that several different kinds of phrase expansion — each with a slightly different expressive effect — can be found in many works from the eighteenth and nineteenth centuries. Rothstein has suggested that information about this aspect of compositional technique and expression is strongly relevant to performers, and some others have engaged his ideas on phrase expansion in writings on analytically informed performance (e.g. Kraus, 1999). The present study assumes that expert performers are indeed aware (whether consciously or unconsciously) of many subtleties of phrase structure, including techniques of phrase expansion. In what follows, the theories of phrase structure mentioned above will be used as a frame of reference for the interpretation of patterns of expressive timing in expanded phrases. The goal is to determine some of the differences in performance expression between expanded and unexpanded phrases, and more specifically, to determine some of the effects of various phrase expansion techniques upon phrase-final lengthening.

This study explores recordings of three pieces that feature asymmetrical period structures, namely Chopin's Preludes Op. 28, Nos. 1 (C major), 3 (G major), and 6 (B minor). All three pieces consist of parallel period structures in which the consequent phrase is more than twice as long as the antecedent phrase. The contrast between the two phrases' tempo profiles is instructive in each case; any differences between them can be considered in rela-

[5] For example, the theme from Mozart's Piano Sonata in A Major, KV 331, is used in at least two influential studies (Todd, 1985; Gabrielsson, 1987). An exception to the preference for normative four- and eight-bar phrase structures is Repp's (1998) analysis of timing in recordings of a five-bar phrase from Chopin's Etude in E Major, Op. 10, No. 3.

tion to the specific techniques of phrase expansion that give rise to extra measures, and on that basis a general principle regarding the effect of a particular expansion technique on the timing profile can be posited. The goal of this preliminary study is to generate a set of musically plausible hypotheses that could be tested in a series of follow-up studies involving recordings of other pieces. Once they are suitably refined, these hypotheses might generate a useful expressive baseline for the interpretation of the timing practices in performances or recordings of various pieces. (In other words, they might serve as useful *heuristic tools* for performance analysis, as discussed in Windsor & Clarke, 1997.) This work also has obvious pedagogical implications.

The term 'phrase' has sometimes been used rather loosely in the empirical literature on performance. Sometimes this term seems to refer to any melodic unit, whether or not it exhibits any sense of harmonic motion and closure. For example, Widmer (1995, p. 95) analyses a two-bar group that moves between I and I^6 as a phrase, despite the absence of harmonic motion and the instability of the final harmony. In such cases, it seems that 'phrase' is being used as a synonym for what Lerdahl and Jackendoff (1983) call a 'group'. To avoid possible confusion, in this study the term 'phrase' will be used in the strict sense as defined by Lerdahl and Jackendoff: "A phrase can be characterized roughly as the smallest level of grouping in which there is a b and a c" (1983, p. 134), where 'b' and 'c' refer to 'structural beginning' and 'structural ending or cadence', respectively (p. 30). V-I progressions are regarded as cadences only if they fall at significant points of melodic and rhythmic closure.[6] To Lerdahl and Jackendoff, the *archetypal phrase* begins with tonic harmony and ends with a perfect cadence (p. 289), and the other standard cadence types – the imperfect (ending on V) and the interrupted (V-VI) – are understood as transformations of the archetypal V-I cadence.

METHODS

For this study, expressive timing was measured using a three-step procedure: first, the onset times for events at the tactus level were identified; second, the inter-onset interval (IOI) for (i.e. duration of) each beat was calculated by simple subtraction; and third, the tempo value for each beat (in beats per minute) was calculated by taking the reciprocal of the corresponding IOI. For Prelude No. 6, onsets were identified using the BeatRoot algorithm (Dixon, 2001), and then corrections were made using a manual onset detection method (Repp, 1998). Sixty-four recordings of Prelude No. 6, a representative sample of the recorded history of the piece, were examined using this method at an early stage in the project (see discography). These recordings were made between 1926 and 2009, but their chronological distribution is somewhat uneven, as only seven of them were made before 1945. (The significance of this date will become clear below.)

For the next phase of the study, two additional pieces (Preludes Nos. 1 and 3) were studied (see discography). Greater efficiency was achieved by reducing the sample size to 30

[6] Rothstein's definition of 'phrase' is similar to Lerdahl and Jackendoff's; he regards it as a unit that includes significant melodic or harmonic motion (Rothstein, 1989, pp. 7 and 16), normally culminating in a cadence.

(a number that seems sufficiently high to mitigate the effect of outliers upon the grand average) and by using a more efficient tap-along method of data collection (Clarke, 2004). Here, a computer program keeps track of keystroke times; the program Sonic Visualiser was used for this portion of the study (see Cook & Leech-Wilkinson, 2009). The tap-along method is less accurate than the manual method, but the error is not cumulative, and the level of accuracy is generally considered to be acceptable for timing analysis at the phrase level. For each recording the average tempo profile was calculated across three tapping trials. Despite the minor reservations about the *accuracy* of this method that were just noted, this method was found to have a relatively high level of *reliability*; the average discrepancy among the three trials was found to be 40±10 ms in the case of Prelude No. 1 and 50±10 ms in the case of Prelude No. 3.[7] It was decided that this level of reliability is acceptable for purposes of the study. Once again the recordings date from 1926 through 2009, but now only one recording (Cortot, 1926) is from before 1945.

When graphs of expressive timing for many recordings of the same piece are overlaid, the composite graph is always heterogeneous, but an overall trend can often be sensed through simple inspection. For example, in an excerpt from a composite graph of the timing data for the 64 recordings of Prelude No. 6 (Figure 2a), most of the recordings seem to move in relatively close parallel formation. Graphs like this give the impression that there is at least a partial consensus among the performers regarding 'how the piece goes.' One way to represent this shared conception is to calculate the grand average tempo profile across recordings (Repp, 1990, 1992, 1997, 1998), as shown in Figure 2b. Here the contradictions between recordings cancel each other out, while points of agreement are retained.[8] This method is not without its critics (Desain & Honing, 1993) but is the most straightforward way to simplify performance data and reveal its structure, so it seems appropriate for a preliminary study such as this.[9] To avoid oversimplification, error bars will be included (Figure 2c); these show the standard error (standard deviation across recordings, divided by the square root of the sample size) above and below each data point.

[7] The absolute values of the discrepancies among the three tap times for each onset were calculated for each pair of trials (trials 1 and 2, trials 2 and 3, trials 1 and 3). The average discrepancy for each onset was then calculated. Finally, to obtain the values reported here, the average discrepancy and standard error across onsets were computed, and these values were rounded to the nearest 10 ms.

[8] Aside from the grand average, Repp (1990, 1998) also makes use of principal components (PC) analysis, a technique that simplifies the correlation matrix for a relatively large data set. Repp suggests that when two or more PCs are found to be statistically significant, each PC can be conceived as a distinct performance strategy, and each recording can be described as a weighted sum of the PCs. I applied this method as part of my initial analysis of Prelude No. 6 but found that there is a steep drop in explanatory value after PC1; the first four PCs accounted for 56%, 6%, 4%, and 4% of the total variance, respectively. According to the scree test proposed in Cattell (1966), PCs cease to be significant when the graph of their eigenvalues (or percent explained) levels off. This test excludes all PCs except PC1. PC1 was also deemed to be very low in interpretability, in comparison to the grand average. For these reasons, and because smaller sample sizes were chosen for the other two pieces, PC analysis was ruled out for this study.

[9] Follow-up studies could make use of more advanced statistical methods, such as cluster analysis, in order to reveal individual performers' habits of expressive timing (see Goebl, Pampalk, & Widmer, 2004).

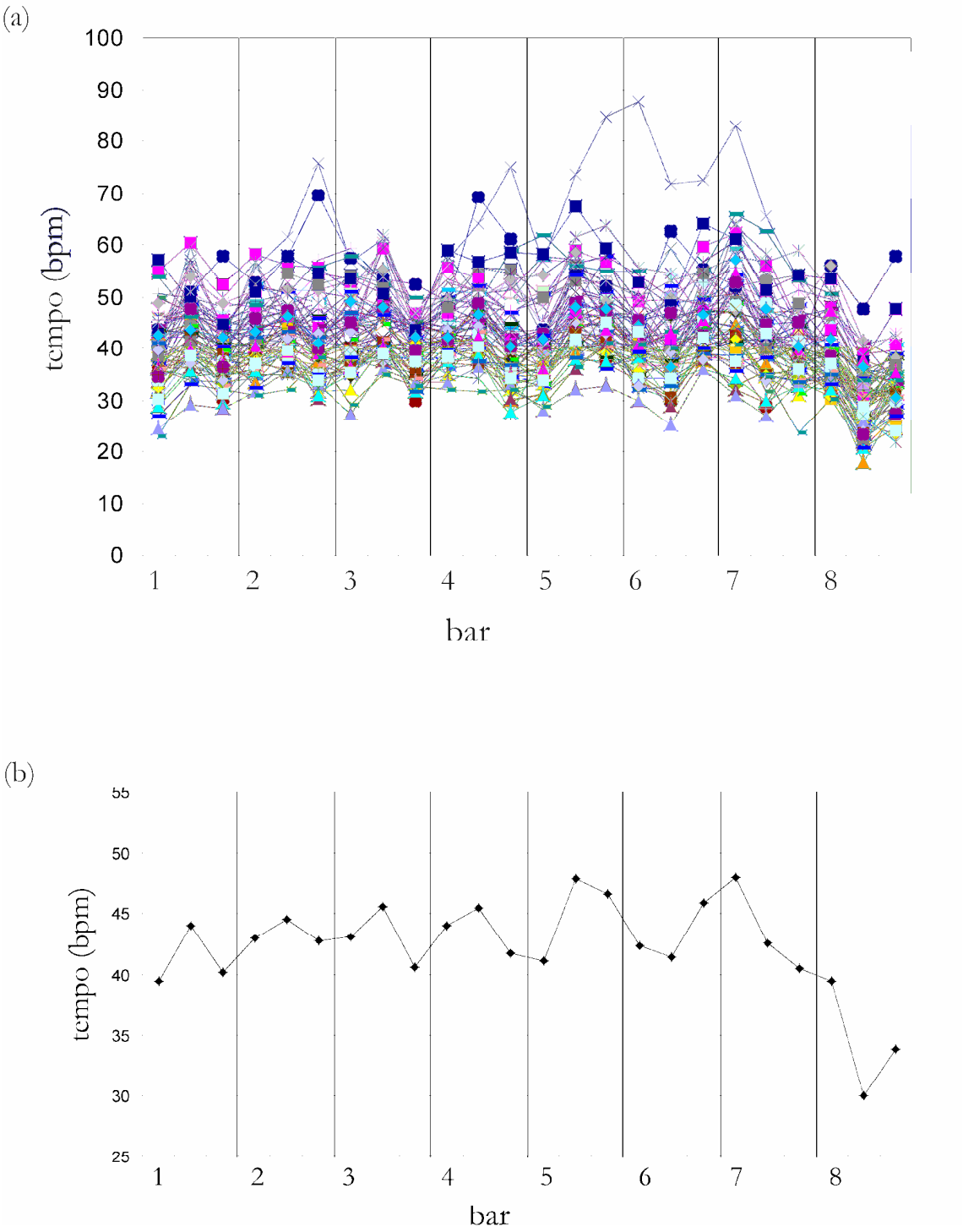

Figure 2. Expressive timing in 64 recordings of Chopin, Prelude No. 6, bars 1-8
(a) composite graph
(b) grand average (continued next page)

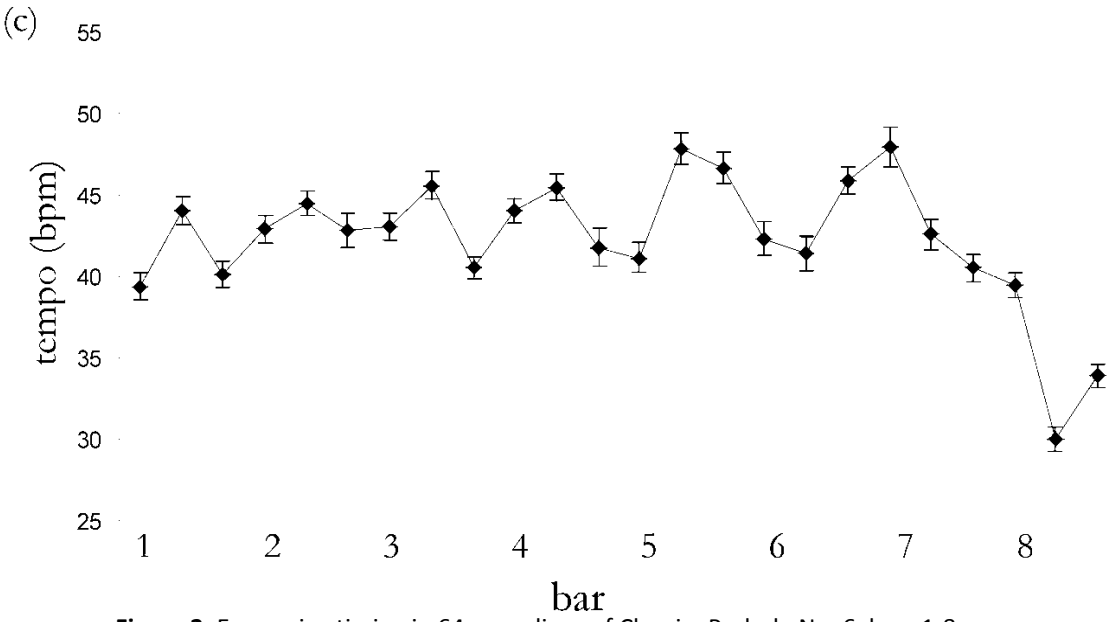

Figure 2. Expressive timing in 64 recordings of Chopin, Prelude No. 6, bars 1-8
(c) grand average with error bars

The orientation of this paper is theoretical and inductive, but broad trends in the history of performance style (such as the changing *tempo rubato* practices described in Philip, 1992) should at least be considered, because of the possibility that two radically different approaches might be conflated in the grand average. In a recent comparative study of a large sample of recordings of Chopin's Mazurkas, Nicholas Cook (2009) found that ubiquitous phrase arching occurs only in modern recordings, so it seems reasonable to ask whether this is also the case in Chopin's Preludes. Are two historically distinct styles of phrasing conflated in a grand average profile like Figure 2c? The simplest way to approach this question is to plot the average tempo profiles of the pre- and post-1945 recordings separately. In a representative case, that of the opening phrase of the B-minor Prelude (Fig. 3), the most conspicuous difference is that the early recordings tend to be somewhat faster overall (48 bpm, versus 42 bpm for the modern recordings). More relevant for this study are the *contours* of the graphs, which are very similar, as demonstrated by the strong correlation between them (r = .86, p < .0001). Notably, both graphs show a marked reduction in tempo during the last two bars, with a nadir at the cadence point (beat 2 of bar 8).[10] The high correlation between the profiles of the earlier and later recordings suggests that the grand average does not conflate two contradictory approaches (characterised by the absence versus the presence of phrase arching) and that the grand average is indeed an appropriate analytical technique for this study.

[10] This tendency is especially strong in the recordings by Alfred Cortot (1926, 1933-34) and Robert Lortat (1928), both of whom studied with Louis Diémer at the Paris Conservatoire. Among the recordings I have examined, the one that diverges most sharply from the norm was made by Vladimir de Pachmann (1929); in this recording, there is no overall deceleration at the end of the phrase. I address Pachmann's performance strategy in this piece in a separate study (Dodson, 2011).

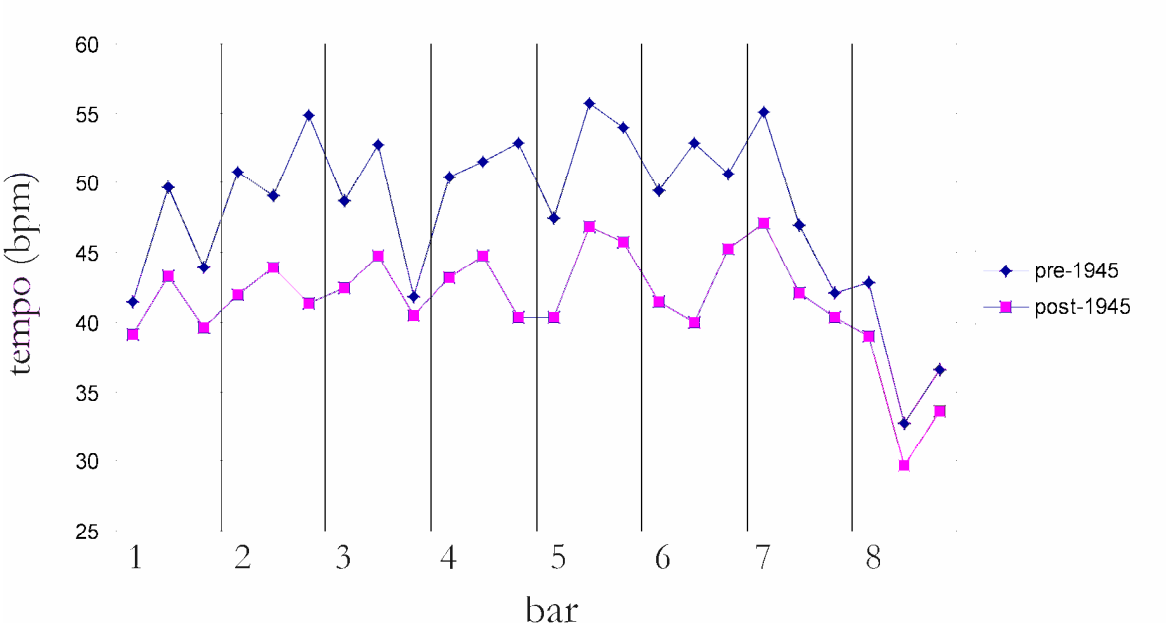

Figure 3. Tempo profiles of early (pre-1945) and modern (post-1945) recordings of Chopin, Prelude No. 6, bars 1-8

RESULTS

Prelude No. 1 in C Major

Figure 4 is an annotated score of Prelude No. 1 that includes some details from the expressive timing analysis. Forward arrows indicate acceleration, and backwards arrows indicate deceleration. Hypermeter labels are included here mainly for orientation; they serve a similar purpose to bar lines and bar numbers.[11] As noted above, each of the pieces chosen for this study has a parallel period design; the first (antecedent) phrase culminates in an imperfect cadence, and the second (consequent) phrase begins just like the first but ends with a perfect cadence. The phrase arch rule predicts that a typical expressive timing profile for each piece should exhibit two well-defined arches, and that the boundaries of these arches should be aligned with the structural beginning and ending (cadence) of each phrase. In this piece, the structural beginnings are the parallel phrase openings (with tonic harmony) in bars 1 and 9, and the structural endings are the imperfect cadence in bar 7 and the perfect cadence in bar 25. In a graph of the grand average tempo profile for the 30 recordings (Figure 5), a clear phrase arch is evident in the antecedent phrase but not in the expanded consequent. Especially noteworthy is the absence of a large cadential ritard in bars 24-25,

[11] A full account of the influence of hypermeter on performance accentuation is beyond the scope of the present paper, but for a critical discussion of this topic, see Dodson, 2002.

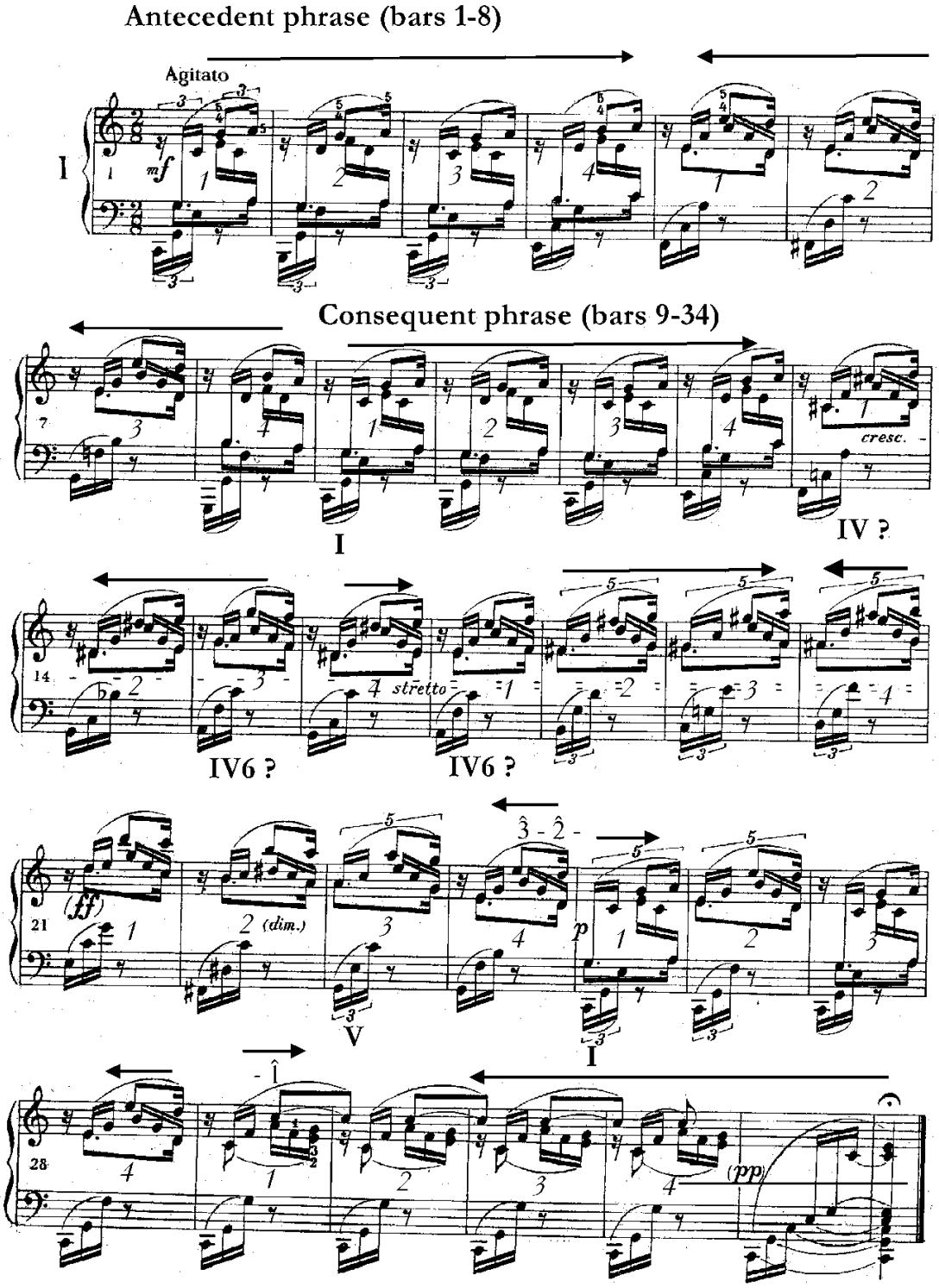

Figure 4. Annotated score of Chopin, Prelude No. 1, showing tendencies from Figure 3[12]

[12] The 'Paderewski edition' (Chopin, 1949) was used for the annotated scores in this paper.

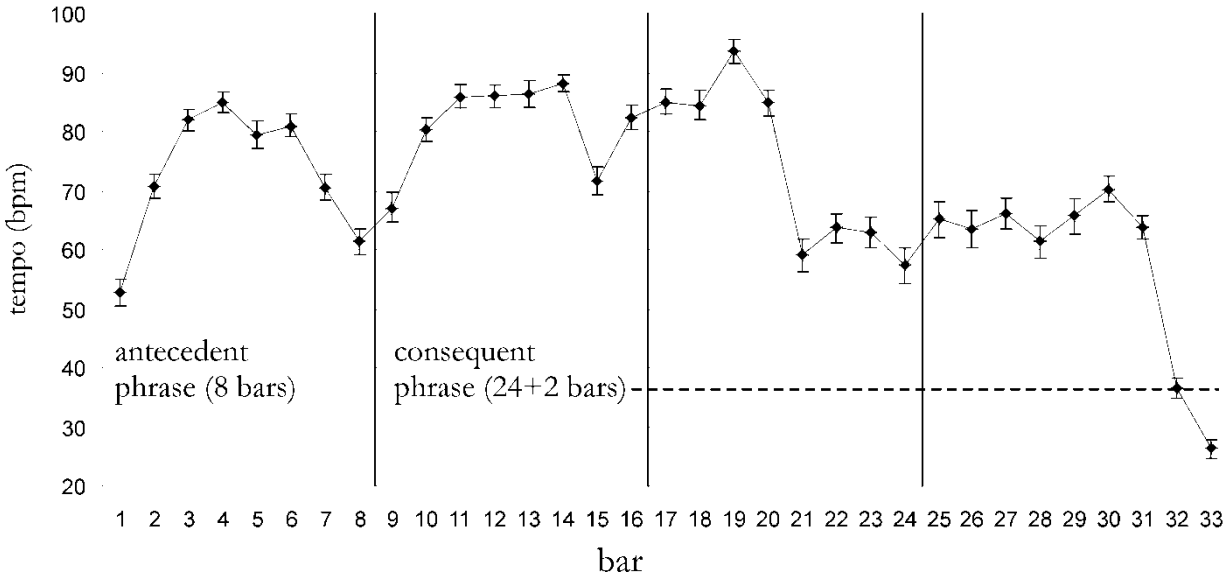

Figure 5. Average tempo profile across 30 recordings of Chopin, Prelude No. 1

where the V-I harmonic motion occurs, or in bars 28-29, where the melodic motion from scale-degree 2 to 1 is completed. Instead, the pianists tend to decelerate most substantially in bar 21, where the registral climax occurs. After bar 21, they tend more or less to sustain the slower basic tempo until bar 32 (three bars from the end), after which point the tempo drops off precipitously. (The last bar in the piece, bar 34, is not shown in Figure 5.)

The pianists' timing tendencies in bar 15 relate to a point on which analyses of the harmonic and linear structure of the consequent phrase have diverged. It is clear that the opening tonic from bar 9 lasts at least until bar 12, that the cadential dominant arrives in bar 23, and that motion directed strongly toward the dominant is under way by bar 17. What is unclear is where the prolongational boundary between the opening tonic and the intermediate (pre-dominant) harmony occurs. Wallace Berry's analysis shows a subdominant prolongation beginning at the earliest possible point, namely at bar 13 (Berry, 1985; Figure 6), and this is where Schenker initially showed it in his performance score (Schenker,

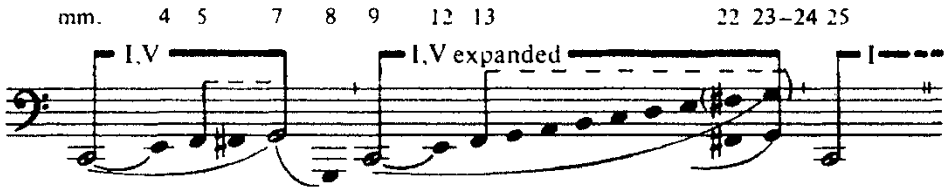

Figure 6. Berry's analysis of Chopin, Prelude No. 1 (Berry, 1985, 19)

[c. 1913]). However, Schenker erased the IV annotation in bar 13 and moved it to bar 17, which is where it appears in an analytical sketch that he prepared more than a decade later (Schenker, [c. 1928], Figure 7a). The difference between these analyses hinges on the interpretation of the 6/4 chord in bar 16. Berry does not even show this chord's bass note in his

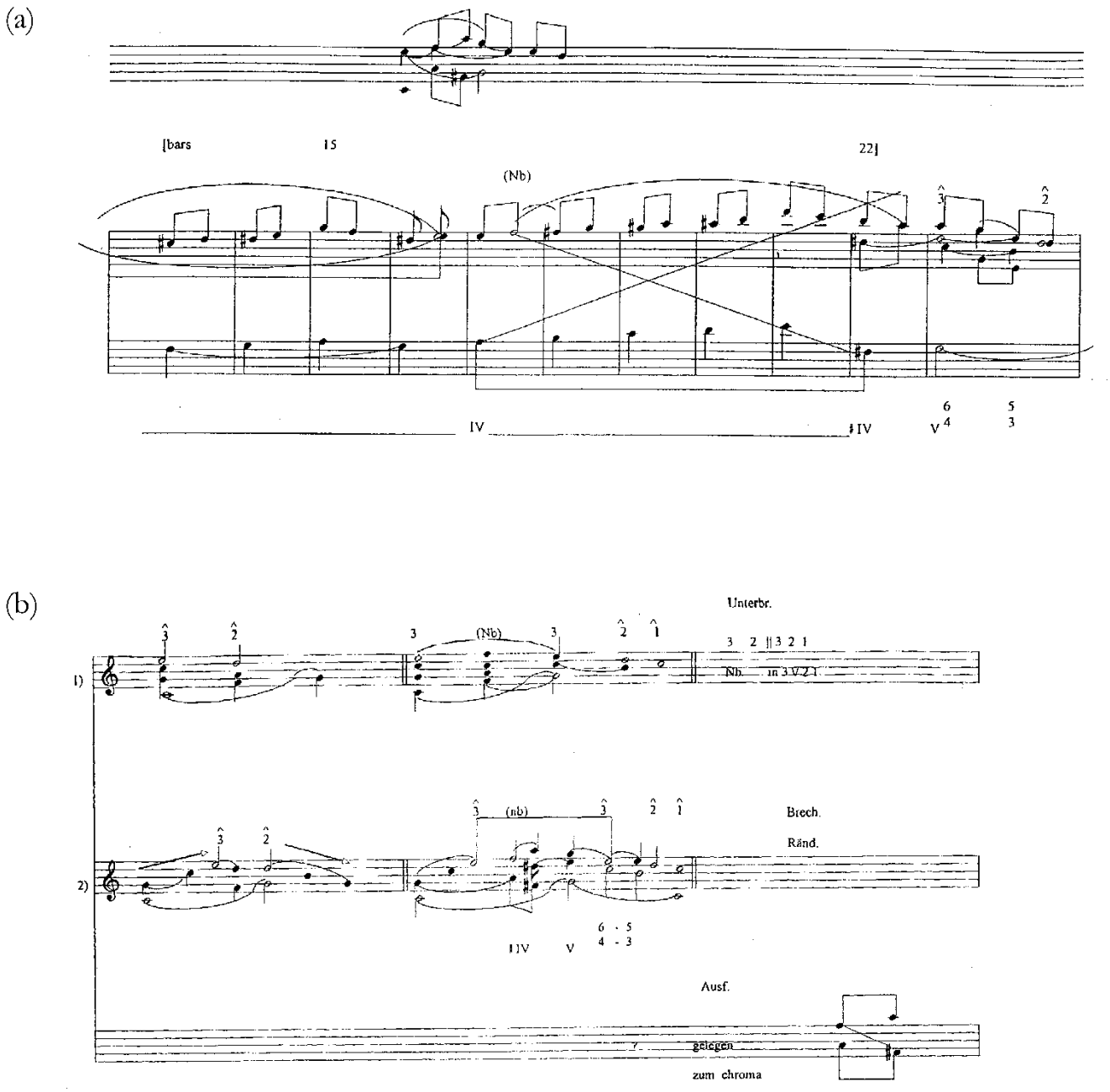

Figure 7. Schenker's analysis of Chopin, Prelude No. 1 (Schenker, [c. 1928], transcribed in Cascelli, 2003), (a) excerpt (bars 13-24) from the foreground analysis, (b) the complete middleground-background analysis

sketch, and this implies that the chord emerges from local auxiliary motion in bars 15-17 (A2-G2-A2 in the bass, F5-E5-F5 in the melody) and serves as the *middle* of a prolongational entity. For Schenker, in contrast, the 6/4 chord in bar 16 emerges from a broader arpeggiation of the tonic triad in the bass of bars 9-16 (C2-E2-G2), making it the *ending* of a prolongational entity. Figure 7b provides the broader context for this foreground reading (see es-

pecially the portion after the first double bar line in parts 1 and 2 of Schenker's sketch). In this middleground-background sketch, Schenker shows the tonic harmony in bars 9-16 as support for the primary tone, scale-degree 3 (E5). He then shows the subdominant harmony in bars 17-22 as support for the first-level neighbour (auxiliary) note, (F5). Finally, he interprets bars 23-28 as the final descent of the *Urlinie* (E5-D5-[…]-C5). It is worth noting that in Schenker's reading, the symmetrical grouping structure established in the antecedent phrase, consisting of regular 4-bar subphrases, is preserved in the consequent. In Berry's reading, the symmetry breaks down after bar 12 because of a lack of rhythmic and harmonic closure in bar 15 (or, to put it another way, because the level of continuity into bar 16 is very high).

A few pianists, including Rafael Orozco, do indeed decelerate slightly in bar 16 (Orozco, [1968]), a decision consistent with what Schenker shows in his analytical sketch. However, most pianists decelerate in bar 15 instead, a point highlighted in neither analysis. This deceleration coincides with the highest note in the first half of the consequent phrase (G5), so it is worth noting that the pianists also have a strong tendency to decelerate for the piece's piece's overall registral climax in bar 21. (The connection between register and expressive timing is well documented; see Sundberg, Friberg, & Frydén, 1989; Timmers, 2007.) Claudio Arrau's recording is representative of this trend (Arrau, 1973).

Although the tendency to decelerate in bar 15 is probably motivated mainly by registral concerns, a harmonic interpretation is also possible: perhaps the pianists are also sensing that the directed motion towards the cadential dominant begins in bar 15 (Figure 8). In other words, perhaps they are offering a harmonic interpretation that contradicts both of the alternative readings that have been proposed by music theorists. (Elsewhere I have referred to such interpretations as 'neither/nor' readings; see Dodson, 2008.) Figure 8 is not very different from Schenker's analysis; the only difference is that the progression from I to IV (and from scale-degree 3 to its upper auxiliary) is now placed at bar 15 instead of bar 17.

Whether they choose bar 15 or bar 16, all of the pianists decelerate at some point midway through the phrase in conjunction with a tonally significant event. A few of them do so in bar 16, where Schenker shows the I/IV boundary, but most decelerate instead in bar 15, where the hypermeasure's registral climax occurs, and where the I/IV boundary could conceivably be shown. What is most significant is that these mid-phrase decelerations appear to be made *at the expense of* the cadential ritard in bars 24-25. This phenomenon does not occur in the 8-bar antecedent phrase, whose melodic climax is reached in bar 5, so it seems to be associated closely with phrase expansion.

Given the precipitous drop in tempo at the ending of the piece, it also appears that some of the deceleration that would normally occur at the final cadence, according to the phrase arch rule, is deferred to the end of the post-cadential extension — a tendency also found in the other two pieces that I examined. It is well known that a work's final measures often contain its most extreme deceleration (Friberg et al., 2004, pp. 148-149), but that phenomenon is equivalent to phrase arching only if the final measures also contain the work's main structural cadence, assuming that we are following Lerdahl and Jackendoff's definition of 'phrase' strictly. All three of the pieces investigated for this study feature both internal

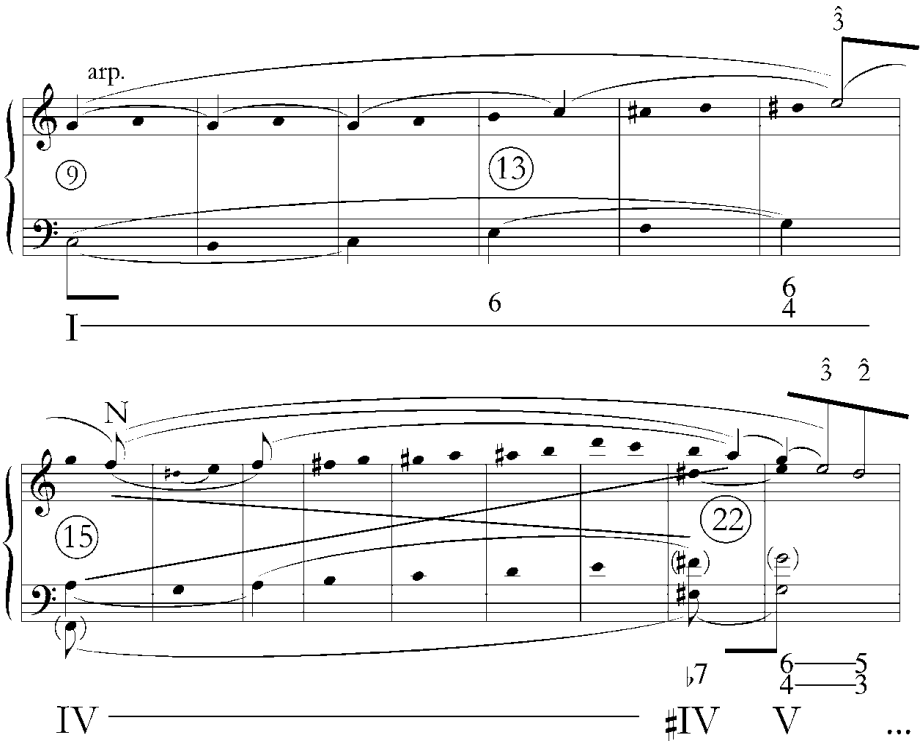

Figure 8. A 'neither/nor' reading of the consequent phrase in Chopin, Prelude No. 1, based on performers' tendency to emphasize bar 15

(pre-cadential) and external (post-cadential) expansions in the consequent phrase, so it is impossible to assess the extent to which each type of expansion influences (i.e. diminishes) the cadential ritard. Exploring the relationship between the cadential ritard and the final ritard in phrases that are *not* internally expanded might help to clarify matters, but that endeavour will have to wait for a future project.

Prelude No. 3 in G Major

Figure 9 is a score of Prelude No. 3, with annotations showing the phrase structure and the main tendencies of expressive timing from the grand average (Figure 10). In this case, the tactus is the half-measure, so there are two tempo values per measure in Figure 10, where light vertical lines indicate measures and heavy lines indicate hypermeasures. The phrase expansions in this piece are somewhat more involved than in Prelude No. 1. Once again the piece has an asymmetrical period design, but now both the antecedent and consequent phrases are expanded.

The simplest expansions are the introduction and postlude, which are extra measures that precede the structural beginning of the antecedent phrase and follow the structural ending of the consequent phrase, respectively. These extra measures consist of an accompanimental vamp, and they serve as a sort of musical 'frame' (Cone, 1968; Rothstein, 1989, pp. 68-73; Caplin, 1998, pp. 15-16).Existing theories of expressive timing do not address the performance of introductions and postludes, and the score does not indicate

tempo changes as such, so it is worth noting that pianists have a striking tendency to use a faster tempo in this work's frame. In most recordings the change is subtle enough that it

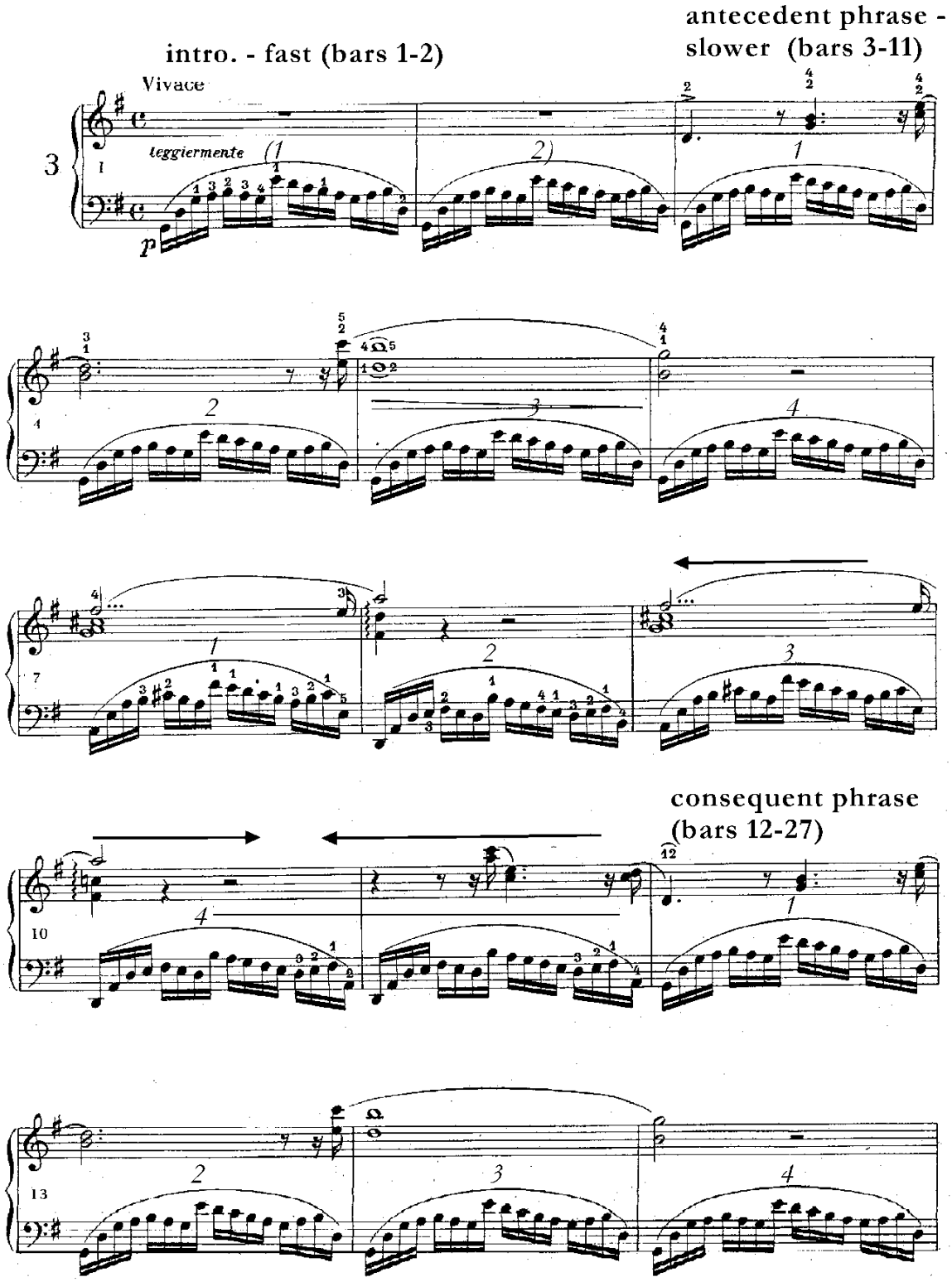

Figure 9. Annotated score of Chopin, Prelude No. 3, showing tendencies from Figure 10 (continues next page)

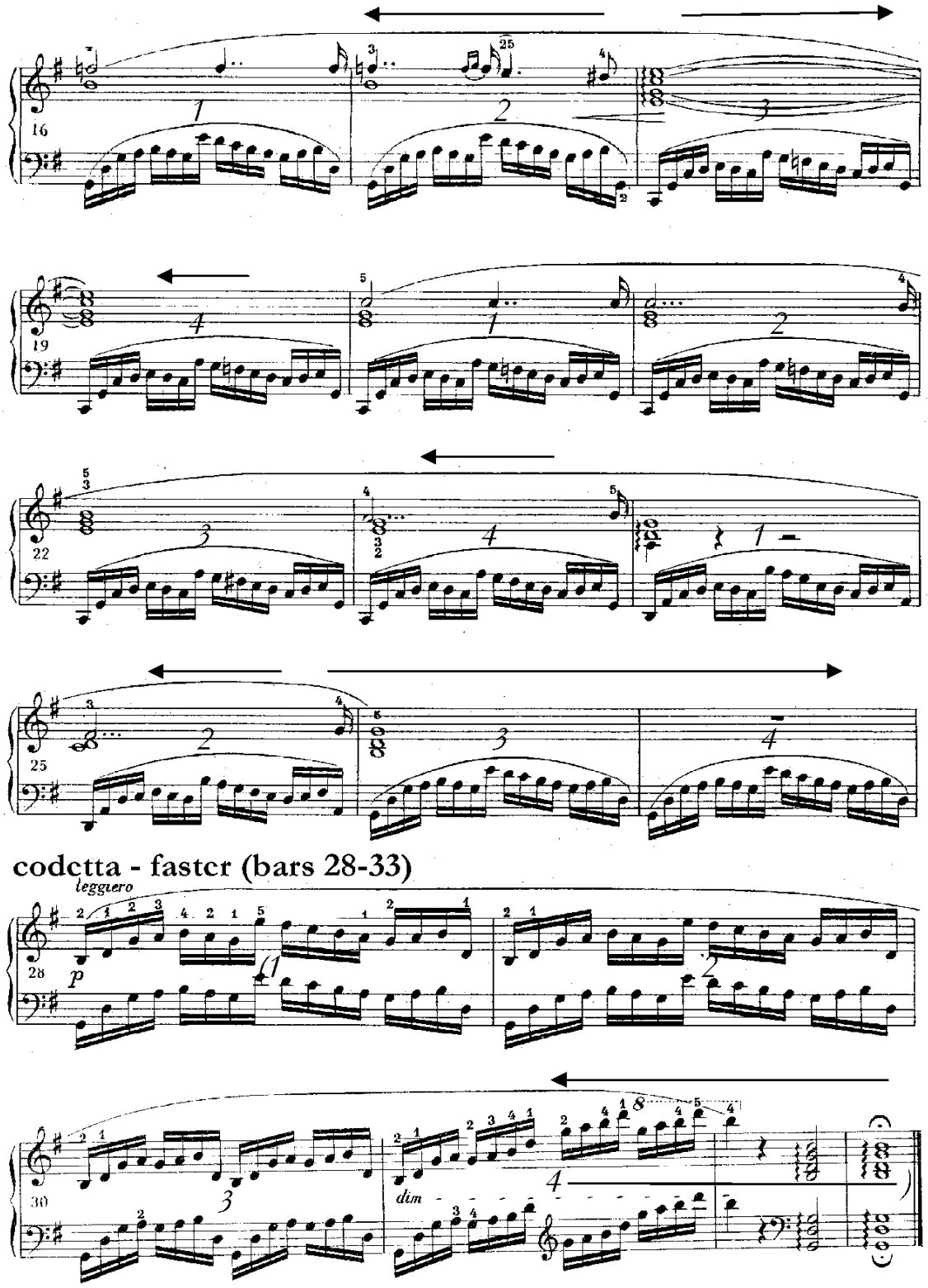

Figure 9 (continued)

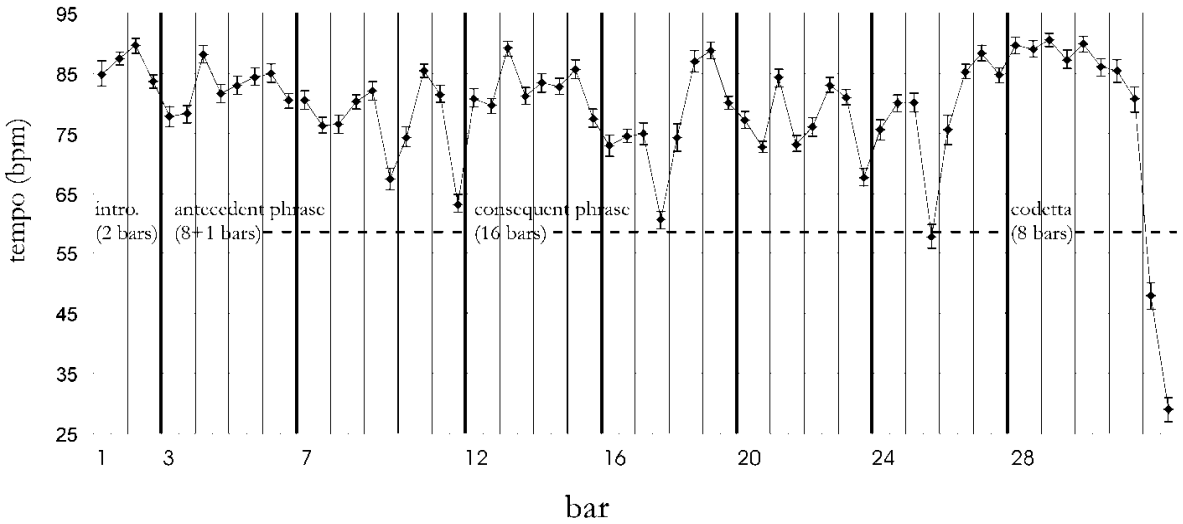

Figure 10. Average tempo profile across 30 recordings of Chopin, Prelude No. 3

seems more like a difference in weight (in accordance with Chopin's expression markings, *leggieramente* and *leggiero*) than a difference in speed. However, the accelerations at the ends of the recordings by Rubinstein (1946) and Novaes (1950) are extreme enough to sound like true tempo changes.

A rather unusual feature of the antecedent phrase is that its cadential dominant appears in three different forms, moving from consonance toward dissonance: first, we hear the dominant triad (bar 8); next, the dominant seventh (bar 10); and finally, in an 'extra' measure at the end of the phrase, we hear the dominant ninth (bar 11). (This extra measure has the effect of a 'written-out fermata'; see Rothstein, 1989, pp. 80-87.) The most harmonically stable of these dominants, the triad in bar 8, falls in the second measure of the cadential subphrase, which seems too early to be a cadence point; and conversely the harmony reached at the end of the cadential subphrase phrase (bars 10-11) seems too harmonically unstable to serve as a cadence point. Pianists tend to respond to this rather confusing situation by distributing the cadential ritard over the entire subphrase, taking progressively more time for each of the three forms of the dominant. The recording by Claudio Arrau demonstrates this strategy especially clearly (Arrau, 1973).

Again the consequent phrase is significantly longer than the antecedent, and its tempo profile includes a sizeable ritard in beat 2 of bar 17. An extreme example is the recording by Jorge Bolet (1987), but a ritard occurs here in virtually all of the recordings. This deceleration draws special attention to bar 18, which is significant in a number of ways. On the simplest level, the C major triad here stands out because it is sustained longer than any other non-tonic chord in the piece, and because it is durationally accented and then reiterated. This chord also completes a V^7–I motion at the end of a group; it is a local point of harmonic resolution, and it could even be heard as a cadence if taken out of context. From a broader perspective, the C major triad is structurally important because it acts as the main intermediate harmony joining the consequent phrase's structural beginning (the tonic in bar 14) to its ending (the V-I cadence in bars 25-26).

Although pianists tend to decelerate into the IV chord, they also tend to return to the established tempo quickly (an example of *compensatory rubato*, or trying to 'pay back' the

time that has been 'stolen'), and they even tend to exceed the basic tempo toward the end of the subphrase. This tendency resonates with Schenker's published analysis of the piece (Figure 11), in which closed noteheads are used in bar 18, open noteheads are used in bar 20, and the Roman numeral 'IV' is positioned under bar 20. These symbols suggest that Schenker regarded bar 18 as a sort of high-level anticipation, and that he wanted to highlight the harmonic and rhythmic continuity into bar 20 as well as the hypermetric downbeat at bar 20. Several performers, most notably Arrau (1973) and Rubinstein (1946), seem to

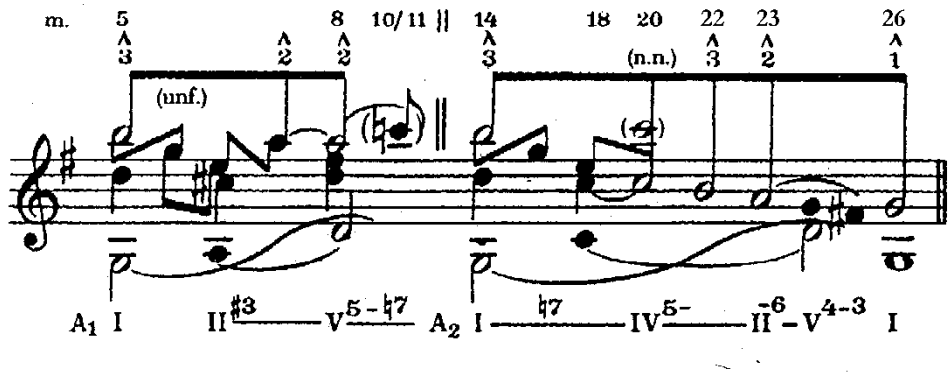

Figure 11. Schenker's analysis of Chopin's Prelude no. 3 (1935, Figure 76/2)

share Schenker's conception of this phrase. After the IV harmony, the arrival of the cadential dominant of the consequent phrase (bar 25) also tends to be highlighted through deceleration, but the arrival of the cadential tonic (bar 26) does not, and indeed performers actually tend to *accelerate* at this point. This contradicts the phrase arch rule, which predicts that phrases decelerate all the way to the structural ending, and not just until the penultimate harmony. As in Prelude No. 1, it seems that the phrase-final lengthening (the deceleration that normally reaches its peak when V progresses to I) is partly preempted by the mid-phrase decelerations, and partly deferred to the ending of the post-cadential extension, where there is once again a sizeable ritard.

Prelude No. 6 in B Minor

Like Prelude No. 1, Prelude No. 6 consists of an eight-bar antecedent phrase followed by an expanded consequent phrase (see Figure 12). The structural endings of the antecedent and consequent phrases are the imperfect cadence in bar 8 and the perfect cadence in bar 22, respectively. Four-bar hypermeasures are present throughout, although one of these is extended to six bars (bars 9-14) through a written-out fermata. Figure 13 shows the average tempo profile for 64 recordings of Prelude No. 6. Tempo data were gathered at the quaver level for 33 of the recordings and at the crotchet (tactus) level for the remaining 31, but the average tempo per bar is graphed here for ease of reading. As in Prelude No. 1, the

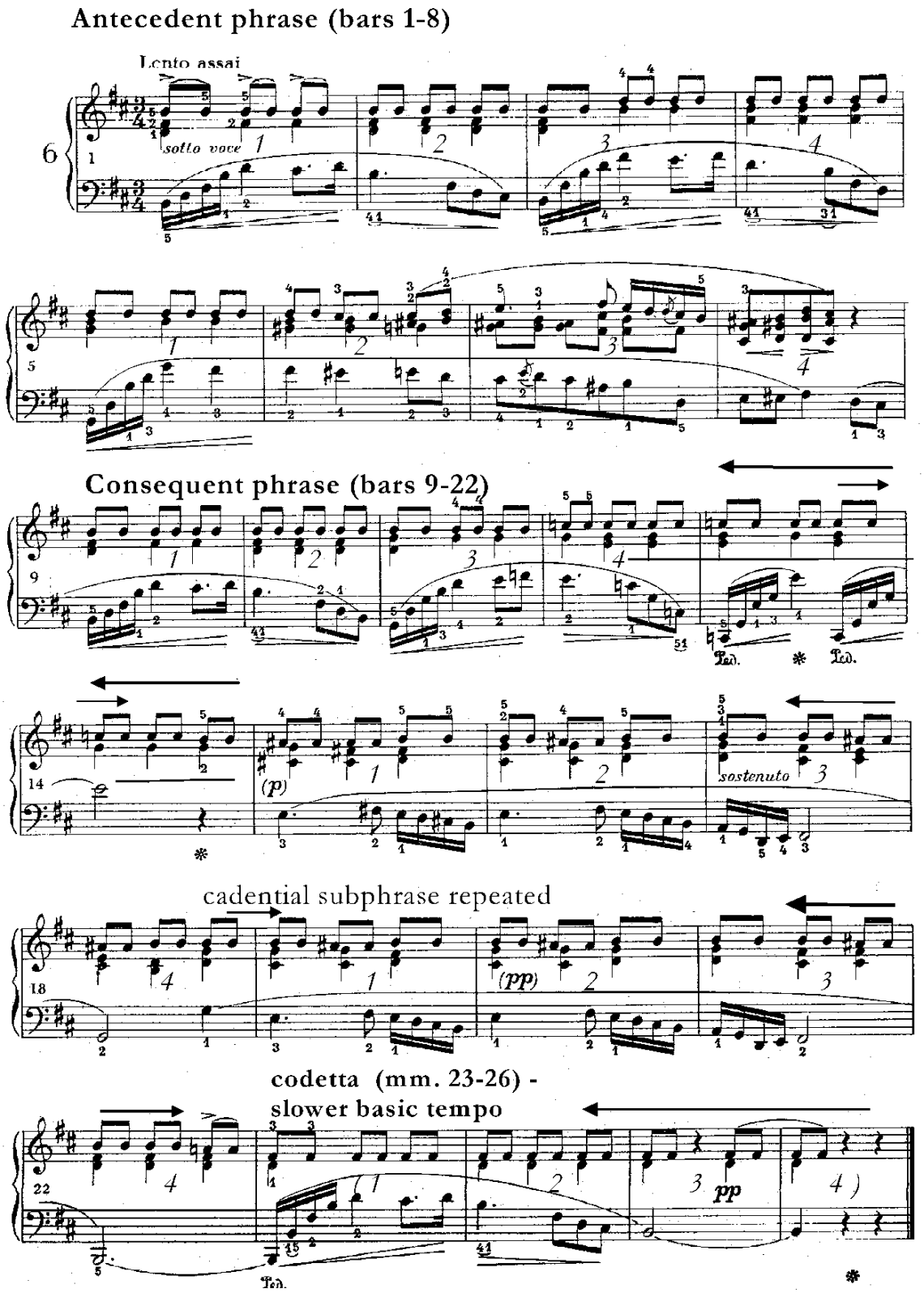

Figure 12. Annotated score of Chopin, Prelude No. 6, showing tendencies from Figure 13

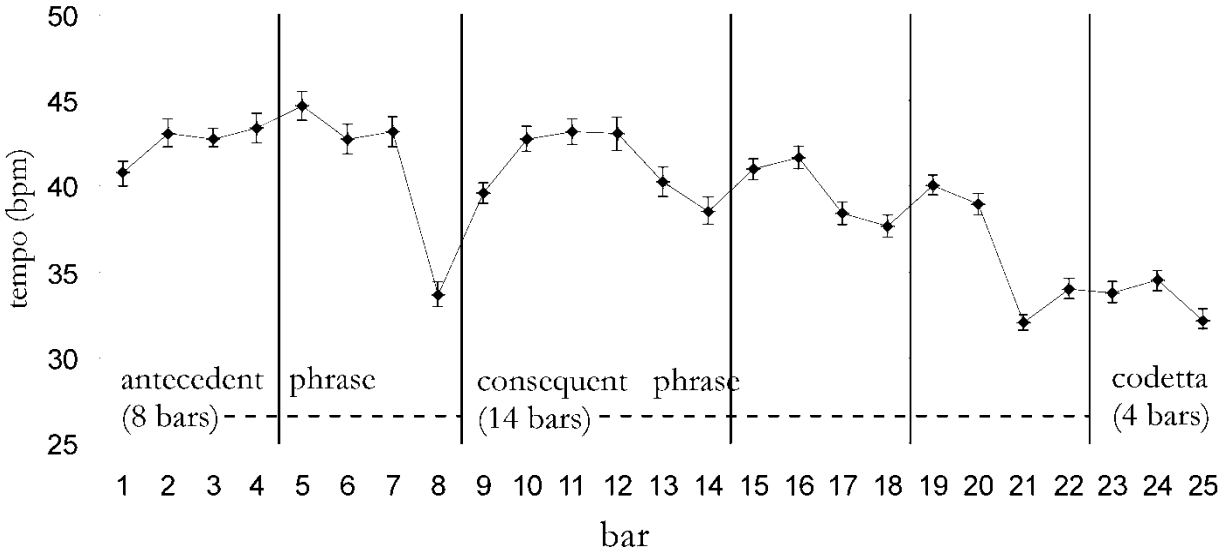

Figure 13. Average tempo profile across sixty-four recordings of Chopin, Prelude No. 6

antecedent has a clear phrase arch, but the expressive timing in the consequent departs from the arch model and includes decelerations at points that are musically significant, but that are not registered in existing theoretical models of expressive timing. The first phrase expansion occurs in bars 13-14, where the C major harmony reached at the end of the first hypermeasure of the consequent phrase is sustained for two extra bars, effecting a written-out fermata. Pianists have quite a strong tendency to take extra time here, thereby enhancing the effect of this expansion technique. As noted above, the same tendency was observed for the written-out fermata in Prelude No. 3. Halina Czerny-Stefanska's recording of Prelude No. 6 demonstrates this tendency well [1959]. Much of the extra time is taken in beat 3 of bar 13, which emphasizes the repetition of the ascending semiquaver motive at that point, as well as the hemiola effect brought about by that repetition.[13] Like the mid-phrase ritards in Preludes Nos. 1 and 3, the deceleration in bars 13-14 of Prelude No. 6 involves the arrival of the consequent phrase's intermediate harmony—in this case, the Neapolitan sixth (see bars 12-14 in the bottom and middle graphs of Schenker's analysis, shown in Figure 14).[14]

In all three pieces, the intermediate harmony arrives at the end of a subphrase and completes a local V^7-I progression, and the pianists tend not only to take time for the arrival of the intermediate harmony but also to accelerate slightly into the beginning of the next subphrase. The acceleration seems to be motivated mainly by hypermetric concerns. Acceleration can give a beat an anacrustic quality (Hasty, 1997; Butterfield, 2006), so these last-minute accelerations help to restore the sense of metric continuity that is attenuated when

[13] This is perhaps the most conspicuous hemiola in the piece, but there are others in bars 7-8, 16-17, 20-21, and 25-26. On the significance of these hemiolas, see Cinnamon (1992).

[14] In Schenkerian theory, the intermediate harmony is the harmony that joins the phrase's opening tonic prolongation to its cadential dominant. Its bass note is often scale-degree 4.

the pianists decelerate, moments earlier, at the point where the fourth hyperbeat is articulated. This effect is especially clear in both of the recordings by Cortot that were studied here (Cortot, 1926 and 1933-34) and in Czerny-Stefanska's [1959] recording. These accelerations may also be related to the works' melodic structures. In all three preludes, the intermediate harmony also supports the first motion away from the *Kopfton* (the first note of the *Urlinie*) in the consequent phrase. In the 'neither/nor' interpretation of Prelude No. 1 that was inferred from the recordings (Figure 8), and in Prelude No. 3 (Figure 11), the motion

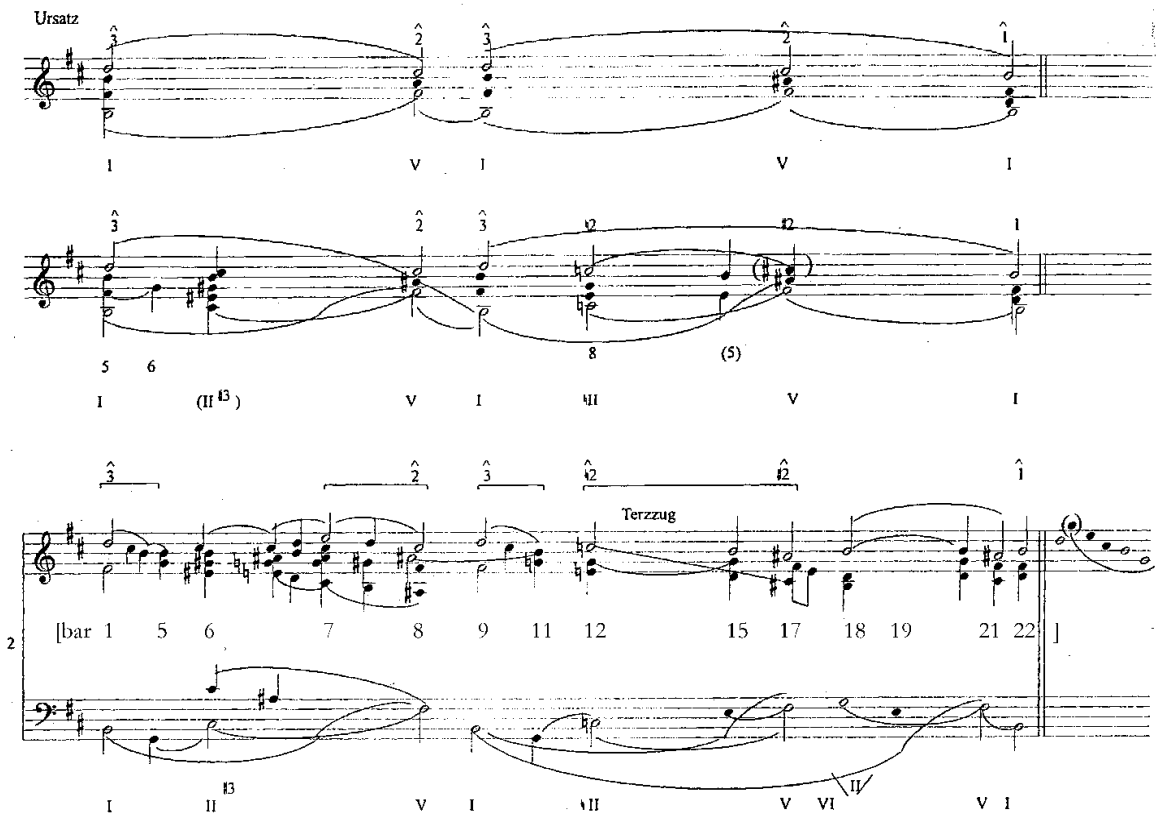

Figure 14. Schenker's analysis of Chopin, Prelude No. 6 (Schenker, [c. 1928], transcribed in Cascelli, 2003)

away from the *Kopfton* consists of an ascent to its upper auxiliary (scale-degree 4). In Prelude No. 6, it instead consists of a descent to a chromaticised form of scale-degree 2 (bar 12), which is later 'corrected' to the diatonic scale-degree 2 (bar 15). Auxiliary notes and chromatic notes are inherently unstable, so perhaps the pianists are responding not only to the hypermetric context but also to considerations of melodic stability and instability when they accelerate at these subphrase boundaries.

The second half of the consequent phrase of Prelude No. 6, beginning in bar 15, is expanded through an interrupted cadence (bar 18) followed by a direct repetition that culminates in a perfect cadence four bars later (bar 22). Schenker's analysis highlights the difference in prolongational status between these two cadences (see Figure 14, middle and bottom levels). According to Schenker's reading, the cadential dominant from bar 18 is prolonged through the interrupted cadence and until the arrival of the cadential tonic in bar 22,

and the submediant chord is understood as a foreground elaboration of the dominant. The pianists' expressive timing tendencies reflect this difference in prolongational status; as Figure 13 shows, the ritard into bar 18 tends to be much more restrained than the one into bar 22. One of the recordings by Alfred Cortot is an extreme case; he actually *accelerates* slightly into the interrupted cadence and he then makes a very pronounced ritard, reducing the tempo by approximately 40%, as he approaches the perfect cadence (Cortot, 1933-34).

In the other pieces discussed above, the mid-phrase ritards seem to undermine the ensuing cadential ritard substantially. In Prelude No. 6, however, four of the extra measures arise from an interrupted cadence, a technique that greatly increases the level of harmonic tension. It is perhaps for this reason that in Prelude No. 6, the ritard at the structural cadence is not drastically undermined. The contrast between the pieces' tempo profiles, in this regard, shows that a theory of expressive timing in expanded phrases should address not only the *locations* of the extra measures, but also their relationship to harmonic structure of the phrase as a whole.

Although the cadential ritard does not appear to be preempted in Prelude No. 6, there is still a sense in which part of the deceleration associated with the final cadence is deferred, because the deceleration at the very end of the piece is even more extreme than at the cadence point. After a nadir during the cadential dominant in bar 21, the tempo actually tends to accelerate slightly during the cadential tonic in bar 22. A moderate tempo is then sustained for three bars, and finally there is a precipitous deceleration for the last two bars of the post-cadential extension.

CONCLUSIONS

This study reaffirms the view that, irrespective of performers' conscious intentions, their expressive timing practices tend to correspond closely to aspects of the musical structure. More specifically, it shows that pianists tend to respond to many of the techniques of phrase expansion outlined by Rothstein (1989), and not just to the more rudimentary aspects of phrase structure (melodic contour, location and hierarchical depth of phrase boundaries) that have been discussed in the literature on expressive timing to date. Although it focuses on only three short works, this study encompasses a relatively large number of recordings and provides a basis for at least a preliminary list of hypotheses:

1. The 'phrase arch rule' applies mainly to short, symmetrical phrases (e.g. the antecedent phrases of Preludes Nos. 1 and 6).

2. At least one salient deceleration tends to occur midway through an expanded phrase, and the deceleration at the end tends to be less pronounced (e.g. the perfect cadences of Preludes Nos. 1 and 3), except in phrases expanded through an interrupted cadence (see rule 6).

3. The mid-phrase deceleration tends to coincide with, or to directly precede, an event that is tonally and metrically significant. Examples of tonally significant events include (a) a melodic climax (Prelude No. 1), (b) a local V^7-I progression (Prelude No. 3), and (c) the arrival of the phrase's intermediate harmony, i.e. the main harmony that joins the structural begin-

ning (usually a tonic prolongation) to the structural ending (cadence) (Preludes Nos. 1, 3, and 6).

4. If a phrase has a post-cadential extension, then some of the deceleration associated with the cadence is deferred (e.g. the perfect cadences of Preludes Nos. 1, 3, and 6). In other words, the deceleration at the end of the piece is, in such cases, much more pronounced than the deceleration at the structural ending.

5. Written-out fermatas tend to be slow (Preludes Nos. 3 and 6).

6. The deceleration into an interrupted cadence tends to be less extreme than the deceleration into the perfect (structural) cadence that follows it (Prelude No. 6). This is consistent with the Schenkerian view that a dominant prolongation transcends the interrupted cadence.

7. Prefixes (introductions) and suffixes (codettas) that consist entirely of an accompanimental vamp tend to have a faster basic tempo than that of the central material (Prelude No. 3).

8. In most other contexts, the basic tempo of a post-cadential extension tends to be slower than that of the rest of the piece (Preludes Nos. 1 and 6).

It is hoped that this list might provide a starting point for further empirical research on the relationship between phrase rhythm and expressive timing in expert performance. A robust understanding of that relationship would provide an illuminating context for the interpretation of individual performances and recordings, and for the comparison of different recordings of the same piece. The relationship of these principles to various historical performance theories (e.g. Lussy, 1892; Riemann, 1884; Schenker, 2000) and to the conscious interpretive strategies and interpretive language of present-day practitioners and listeners would also be valuable areas for future research. Above all, it is hoped that the pragmatic value of performance theories will continue to be a fruitful topic for debate in our analysis classrooms, and for creative experimentation in our teaching studios and practice rooms.

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For the sake of simplicity, only one date is provided per recording. Where known, the date of recording is used. Dates that are not preceded by "rec." indicate the date of issue or reissue. In cases where no date is printed on the disc or disc jacket, an estimated date of issue is provided in square brackets, based mainly on the date of the earliest appearance in the Schwann catalogue or the earliest North American record review (Myers, 1978, 1985, 1989). The two comprehensive Chopin discographies (Panigel & Beaufils, 1949; Kański, 1986) were also consulted, but these were used with caution, because several errors were detected in them.

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